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The South-East Consortium for International Development

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A PROPOSAL FOR  
A COOPERATIVE REGIONAL DEMONSTRATION PROJECT (CRDP)  
IN THE  
RUHENGERI PREFECTURE OF RWANDA

TO BE CONDUCTED  
UNDER THE AUSPICES OF THE  
ENVIRONMENTAL TRAINING AND MANAGEMENT IN AFRICA PROJECT  
(698-0427)

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U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT  
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THE SOUTH-EAST CONSORTIUM FOR INTERNATIONAL DEVELOPMENT

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GLOSSARY

AIDR	- Association Internationale de Developpement Rural
AWF	- African Wildlife Foundation
BPES	- Bureau Pedagogique d'Enseignement Secondaire
BCEOM	- Bureau Central d'Etudes pour les Equipements d'Outre-Mer
CCDFP	- Centres Communaux de Developpement et de Formation Permanente
CRDP	- Cooperative Regional Demonstration Project
ETMA	- Environmental Training and Management in Africa
FSR	- Farm Systems Research, Development and Extension Project
GOR	- Government of Rwanda
Inspecoop	- Inspecteur des cooperatives
MINAGRI	- Ministere de l'Agriculture
MINEDUC	- Ministere de l'Education
Monagri	- Moniteur Agricole (Extension and Training)
MRND	- Monument Revolutionnaire
NATENRWA	- Nature and Environmental Program for Rwanda
OEA	- Office of Environmental Affairs
ORTPN	- Office Rwandaise de Tourisme et des Parcs Nationaux
PNAP	- Programmes Nationaux d'Amelioration de la Pomme de Terre
PNV	- Parc National des Volcans
REDSO	- Regional Economic Development Support Office
SECID	- South-East Consortium for International Development
UNR	- Universite Nationale de Rwanda
USAID	- United States Agency for International Development

**PART I**  
**PROJECT DESCRIPTION**

## INTRODUCTION

The Cooperative Regional Demonstration Project (CRDP) was designed by the U.S. Agency for International Development (AID) through its Environmental Training and Management in Africa (ETMA) project and by the Government of Rwanda (GOR). The CRDP is a new concept in development assistance designed to address environmental problems caused by a number of factors linked to economic development programs. The CRDP as presented in this project document is the first of its kind; its successful implementation will hopefully serve as a model for application elsewhere in Africa.

The CRDP differs from other past ETMA project environmental programs in the following manner:

1. Rather than carrying out widely diffused seminars in both East and West Africa the CRDP will concentrate ETMA project resources in one specific geographical area.
2. By enjoining the cooperation of other donors and the host government already operating in the area, it is hoped that other donor resources can complement the ETMA project's limited resources to focus on critical environmental problems.
3. By concentrating on a specific geographic area and creating a framework for other donor cooperation, it is hoped that a useful decision-making methodology can be developed to help the Government of Rwanda more rationally utilize natural resources, yet sustain economic development. The application of this methodology to other areas in Rwanda would thus focus more attention on the critical role of the environment in Rwanda's overall economic and social development.
4. Once the methodology has been developed in this project, it would be adapted to other areas of Rwanda and East and West Africa.

For the above purposes the Prefecture of Ruhengeri in Rwanda was chosen by AID, ETMA project technical personnel, and the GOR, based on the following conditions: (1) Ruhengeri includes five distinct ecological zones with fairly representative environmental problems. The mitigation of these problems could be applied to similar ecological zones in Rwanda and central Africa. (2) Natural resource degradation has not progressed to the degree that its mitigation would be futile. (3) USAID in its bilateral program plans to implement new agricultural projects in Ruhengeri providing an opportunity to focus some of its activities on environmental problems and their solutions. (4) There is evidence that other donors financing projects with the GOR are already addressing some critical environmental problems (i.e., forestry, erosion, water pollution). These field efforts will aid the ETMA program tremendously in rapidly identifying problems and their solutions.

### The CRDP Strategy

This project document, advances the following two-pronged strategy designed to improve the use of natural resources in Ruhengeri and sustain economic development:

1. The GOR's adoption of an integrated natural resource planning and management methodology. This is an important institution building element of the project.
2. On-going public education to increase public awareness of environmental problems in a given area.

The intent in this strategy is to approach better natural resource management from the top (i.e., the central government planning and development agencies) as well as from the bottom (i.e., local government, public training centers, extension services, and demonstrations to the population).

The program to carry out the above strategy was designed to draw on the resources of other donors. This project has therefore been divided into two parts: (1) a core project consisting of essential project elements that will be financed with ETMA funds and (2) adjunct project activities that will require other donor financing and result in a truly comprehensive approach to the environment.

## 1.0 PROJECT PURPOSE AND LONG-TERM GOAL

### 1.1 Long-Term Environmental Goal

The long-term goal of the ETMA financed Cooperative Regional Demonstration Project is to sustain the natural resource base of Rwanda and to minimize environmental problems during intensified economic development and land use.

The Government of Rwanda realizes that intensified land use resulting from high population growth and economic development jeopardizes the sustained productivity and stability in Rwanda. However, increased agricultural production and economic development are vital to the nation's survival. Any gains in agricultural production can only be achieved through more intensive use of existing lands because most of the arable land is already under cultivation. If, during the course of intensified land use, natural resources are degraded, economic gains will be temporary.

The GOR faces this dilemma in virtually all its territory. In the Ruhengeri prefecture, population density and growth are among the highest in the world. Virtually all arable land is already under intensive cultivation; natural preserve areas are rapidly being encroached upon by local inhabitants; soil degradation in the form of erosion and loss of fertility is serious; indigenous forests are extinct making fuelwood scarce; local water supply is insufficient despite adequate water resources; water quality is hazardous evidenced by increasing incidence of human disease and loss of fish production. Fortunately, although environmental and natural resource problems are serious, they have not proceeded to the point that their mitigation is futile.

### 1.2 Project Purpose

To accomplish this long-term goal, this project will attempt to accomplish two purposes within the three-year project life:

1. to assist the Government of Rwanda in institutionalizing integrated resource management practices in its development decisions, and
2. to increase public awareness of natural resource and environmental problems and trends.

The project recognizes that all major decisions affecting the development of Rwanda and therefore the use of its natural resources come from the central government planning and executing agencies. At the same time the day-to-day use of these resources is in the hands of a basically subsistence agrarian population. The two-pronged strategy is thus designed to improve the central government's, as well as the local population's, use of extremely scarce resources. Ruhengeri prefecture will serve as the prototypical example of this strategy.

The integrated approach to natural resource planning and management assumes that all natural resources are structurally and functionally interconnected and interdependent. They therefore comprise an integrated ecological system. By

protecting interdependencies of component resources within whole ecosystems, integrated planning and management can minimize counterproductive efforts and maximize sustained productivity.

At the same time public receptivity to natural resource planning and management is dependent on public awareness of environmental and natural resource problems and trends. It would be very difficult for the GOR to implement resource development and management plans if the people who live on the land are not receptive to those plans. Public awareness and receptivity to change will hopefully be achieved through effective education and demonstrations. This project will thus also show the practical efforts of central planning on the general populace through education and field demonstration projects.

If the project is successful in achieving its purposes, we foresee the following conditions:

1. The GOR will be using the methodology developed in this project to aid it in making integrated resource management decisions using ecological principles. By this we mean, the GOR should have the means to identify negative or positive environmental trends, assess the environmental impact of certain development activities on stressed resources, formulate the GOR policy necessary to deal with these trends, and elaborate the technical project requests for GOR and other donor financing to mitigate negative trends.
2. The GOR will have adopted an environmental education curriculum for the formal and non-formal education systems. Local government officials would be using more integrated management techniques, and the population would be exposed to more use of appropriate technology and ecologically sound projects. Radio and other media would be using environmental materials developed in this project for its broadcasts and publications.
3. Finally, initial and post-project socio-economic surveys should demonstrate that individuals in the Ruhengeri area are practicing techniques to use resources more rationally.

## 2.0 DESCRIPTION OF PROJECT OUTPUTS AND INPUTS

### 2.1 Project Outputs

The CRDP is primarily a technical assistance project designed to improve the GOR's use of already limited natural resources. Except for small field demonstrations carried out in conjunction with other donor projects in the Ruhengeri prefecture, there is no major capital improvement financing contemplated. If this type of financing is required i.e., to improve a drainage or water supply system, then other donor financing will be necessary. This project will work with the GOR to elaborate a request for other donor funding.

Five major outputs are expected at the end of this project:

1. An applicable integrated resource management methodology composed of:
  - a. a data base of stressed resources in the Ruhengeri prefecture.
  - b. trend analysis and simulation of these trends with hypothetical and existing uses.
  - c. findings that can be formulated into project requests for other donor financing or GOR policy guidance.
2. Local demonstrations of techniques to remedy localized environmental problems in Ruhengeri in cooperation with other donor projects already in place.
3. An environmental education program curriculum designed for the public schools and training centers.
4. An effective inter-ministerial coordinating committee drawing together the ministries and agencies having charge of various natural resources in the Ruhengeri region.
5. Trained GOR personnel in all the above activities.

### 2.2 Project Inputs

The project will rely primarily on short- and long-term technical assistance and local, on-the-job training to accomplish its purposes. No capital development is expected in the core project.

If environmental problems are identified requiring capital improvement (i.e., water supply system, clean-up of polluted areas) in the Ruhengeri prefecture, there may be need for the GOR first to decide which action deserves priority and second to seek another donor to carry out the operation. The ETMA core project will supply the data and project design for such a request for additional funds.

Project inputs are summarized below:

1. Technical Assistance

a. Long-Term technical assistance:

-- Project Field Director: three years

b. Short-Term technical assistance:

-- Computer Specialist  
-- Socio-Anthropologist  
-- Environmental Education Specialist  
-- Water Engineer  
-- Agricultural Economist  
-- Forestry Expert  
-- Wildlife Specialist  
-- Soil Scientist

2. Short- and Long-Term Training

- a. Counterpart training: two full time GOR employees assigned to ETMA project office.
- b. In-country training seminars.
- c. U.S. training in integrated resource management and environmental legislation.
- d. Conferences.

### 3.0 IMPLEMENTATION OF THE CRDP

This section will deal with how all project elements are to be executed and how they are interrelated.

#### Definition of the Core ETMA Project and Adjunct Project Activities

The Cooperative Regional Demonstration Project will be divided into two principal implementation parts: (1) the core project to be financed directly with ETMA project funds and (2) the adjunct project activities to be financed by other donors but supervised by ETMA project personnel. The core project can be implemented and can accomplish, to a limited extent, the project purposes even if other donor financing is not available. However, the core project enhanced by other donor participation will be a more potent environmental program.

Section 3.1 below, will discuss the organizational measures which the ETMA project and the GOR should take to carry out the core project. Section 3.2 will discuss the phasing of the project activities, and Section 3.3 will outline the necessary participation of the other donors showing where their participation fits into the entire scheme.

#### 3.1 Core Project: ETMA and GOR Organizational Measures to Implement Core Project

Described in this section are three organizational measures that the ETMA project and the GOR will undertake to begin institutionalizing a process of integrated natural resource management into the GOR development decision-making process. Each of the following organizational measures has a specific institution building role:

1. A pre-project seminar.
2. A field project office in Kigali with a defined development role.
3. A GOR inter-ministerial coordinating mechanism.

##### 3.1.1 Role of the Pre-Project Seminar

Prior to approval of the ETMA core project, ETMA funds will finance a three-day seminar (funds will come from the ETMA seminar budget). The pre-project seminar will have three objectives: (1) to review concepts of integrated resource management with GOR officials; (2) to review the project document; and (3) to make recommendations for a GOR coordinating body to oversee the implementation of this project.

These objectives are designed to stimulate active government participation in this project's planning, lay the basis for GOR commitment to the project, and finally, begin a process of inter-ministerial coordination of project activities with a focus on interrelated environmental problems.

Participants in this seminar will be from at least the office director level, representing one of the eight ministries and offices involved in the implementation of this project. The most feasible way of coordinating the project's activities between these ministries will be defined.

After the seminar, ETMA staff will incorporate the necessary implementation changes as well as the seminar's recommendations for a coordinating body into this document. This revised document will then be translated into French and re-submitted to the GOR for final approval. As evidence of this approval, all ministries involved in the implementation of this project should be signatory to the letter of agreement or grant agreement signed between the South-East Consortium for International Development (SECID), the prime contractor for the ETMA project, and the Government of Rwanda.

Details on the organization and content of this seminar are included in Section 12.

### 3.1.2 Establishment of the ETMA Project Office: Its Development Role

After the project document has been approved by the GOR, SECID, and AID, ETMA staff will begin setting up the project office in Kigali.

The primary purpose of this office is an institution building one. It will serve as a prototype for instituting integrated resource management in the Government of Rwanda. The office will work closely with its main counterpart, the Environmental Affairs Office in the Ministry of Social Affairs (unless otherwise designated) to administer the project inputs. It will use the project activities to train GOR officials needed so that they can succeed the project personnel. The project office should, at the end of the project merge into the government's environmental office. It should be emphasized that the project office does not only administer the project elements but has a critical development role in instituting integrated resource management techniques in the GOR.

As the main administrative and substantive arm of the ETMA core project, the project office will have the following functions:

1. Work closely with the Office of Environmental Affairs of the Ministry of Social Affairs to assure that all project elements are properly executed;
2. Serve as provisional technical backstop to the current Environmental Affairs Office in presenting project findings to the coordinating body for decisions;
3. Aid the current Environmental Office in its role of coordinating other donors in the field of environmental actions;
4. Train government counterparts through their participation in the execution of the project activities and through specific training programs and seminars;

5. Work closely with the GOR's environmental office to create in accordance with the pre-project seminar's recommendations, an inter-ministerial coordinating body for this project and for subsequent development activities; and
6. Provide necessary logistic and administrative support to all short- and long-term project personnel in their execution of project activities.

Personnel contemplated for this office are as follows:

- Project Field Director
- Administrative Assistant and Typist
- Part-Time Accountant
- Driver/Mechanic

U.S. backstopping for this office will be provided by the ETMA office in SECID, Chapel Hill, North Carolina.

### 3.1.3 Establishment of an Environmental Coordinating Mechanism

A GOR coordinating mechanism will eventually assure integrated resource management in the GOR. It is the GOR's major contribution to this project. It should be the outcome of the pre-project seminar and the on-going effort of the project office to realize this functioning coordination body.

The scenario for the creation of a coordinating body is as follows: first, the pre-project seminar mentioned above will hopefully produce recommendations or even an informal mechanism with which to start the project; second, the project office will function with its government counterpart (the Ministry of Social Affairs) to create a viable secretariat for such a mechanism; and third, the project provides for on-the-job training of government officials participating in the various studies and demonstrations financed under the ETMA core project. Finally, the activities, findings, and other donor projects elaborated by this project will serve as the initial work agenda of the coordinating body. The combination of these resources and the GOR's recognition of the need for such a mechanism should promote its establishment.

The precise form of an environmental coordinating mechanism can range from an informal committee among ministries to a more formal body such as a National Office or Ministry. If an informal mechanism is preferred by the GOR, then a regular government ministry must provide it with a secretariat. If a more formal mechanism is chosen, such as a new ministry, then all secretariat and coordinating functions would pass to it.

A coordinating body on environmental affairs would ideally carry out the following functions:

1. Serve as an "environmental focal point" responsible for seeing that environmental and natural resource considerations are given proper weight in the government's planning, programming, and budgeting functions;

2. Advise other ministries of the environmental impacts of their proposed development projects. Promote studies to measure the environmental impact of various development projects (current and past) to avoid repetition of the same mistakes;
3. Interpret current legislation or even propose legislation in environmental and natural resource management;
4. Serve as the repository of detailed data about the productivity and vulnerability of renewable resources, about the impact of alternative uses, about optimal rates of exploitation, about tolerable pollution levels, and the socio-economic impact of the resource management;
5. Promote and find financing for training all levels of manpower in a variety of professional and technical disciplines such as environmental sciences and engineering, planning, economics, law, and administration;
6. Promote continued interest in environmental education to generate a higher level of public support through public school curricula and mass media programming;
7. Draw up a "state of the environment" report to the GOR and the public each year;
8. Coordinate all land use decisions in the early planning stages; and
9. Promote and find financing for actions designed to mitigate negative environmental trends.

### 3.2 Core Project Activities

Once ETMA has established its field office, and the GOR can assure a workable form of inter-ministerial coordination, the project and the GOR will undertake two categories of actions. Each category is comprised of a series of actions that will contribute toward accomplishing one of the project purposes.

#### 3.2.1 Core Project Activities to Introduce Integrated Natural Resource Planning and Management to the GOR

In order to develop an integrated natural resource planning and management capability in the GOR the project must: first, develop an integrated natural resource planning and management methodology using Ruhengeri prefecture as a prototypical mode. The steps by which this methodology will be elaborated are covered in Section 3.2.1.1 below. Second, it must train key government officials in the actual field work, compilation, and simulations. In addition ETMA staff will organize local seminars and conferences on specific issues for central government and Ruhengeri officials. Third, it must work with the GOR's coordinating mechanism to introduce the above methodology into the government decision-making process using concrete findings from the Ruhengeri prefecture in order to generate other donor financing.

These three simultaneous project activities should at the end of the project provide the GOR with trained personnel who will be able to use an analytical methodology to determine the effect of development on the whole of a given ecological system.

3.2.1.1 Core Project: Development of the Environmental Planning and Management Methodology Using Ruhengeri as a Model

The development of a methodology will go through three stages: (1) an inventory of key natural resource stress points; (2) an assessment of environmental trends in the Ruhengeri prefecture; and (3) development of simulation models for projections on the future status of the prefecture's resources.

1. Inventory of Key Natural Resource Stress Points

To project changes in the natural resources of a region under the influence of management policies and natural processes, it is necessary to have an understanding of the existing natural resource systems. The initial activity of this phase of the project will be to conduct an inventory of existing information on resources under specific environmental stress. All information will be recorded and stored in a standardized computer storage and retrieval system.

The inventory stage will begin with a socio-economic inventory of the Kidaho, Kinigi, Cyeru, Nyamutera, Nkuli, and Ruhengeri communes. It will try to determine the effect of population trends, health practices, agricultural practices, and social structure on the environment.

Closely following the socio-economic study will be a general public health survey to determine the historic health profile of the sample communes. The same informants used in the socio-economic study will be tested.

The same sample communes will then undergo physical and biological resource inventories concentrating on water quality, soils, aquatic, and terrestrial wildlife, forests, and vegetation.

It is estimated that inventory work should begin by the third month of the project and be completed by the end of the first year. Some field work to fill obvious gaps in the inventory will have to be carried out.

All inventories will be carried out by short-term experts recruited locally, in the U.S., or through interested donor agencies.

2. Assessment of Environmental Trends in the Ruhengeri Prefecture

The inventory and field data collected for the data base will be analyzed for trends in natural resource degradation, depletion, restoration, policies, management practices, and development. Existing software will be adapted to this exercise.

Identification of environmental trends resulting from these initial simulations should begin at the start of the project's second year. Critical problems will be brought to the attention of the coordinating body with suggestions for short- or long-term remedies. It will be the task of the coordinating body to decide which environmental trends require priority action.

### 3. Formulating Environmental Project Requests

As a result of the priorities set forth by the GOR coordinating body, concrete follow-up actions should be undertaken to mitigate any problem trend:

- GOR campaigns through the UMUGANDA self-help movement.
- ETMA demonstration projects in conjunction with AID or other donor projects.
- ETMA's environmental education program financed under this project.
- Other donor technical assistance or capital development (water systems, infrastructure, etc.) projects.

In order to stimulate such actions, the ETMA project field office will use the trend analyses results to formulate adjunct project requests for other donor financing. The GOR and ETMA should take actions within their budgetary means. However, larger, costlier projects should be presented to other donors.

#### 3.2.1.2 Core Project: Training of GOR Officials

In addition to the data collection, manipulation, and project formulation, the ETMA project will place great emphasis on training GOR officials during the development of the management methodology. Most training will take place in-country as a consequence of the project activities.

The project requires that at least two government counterparts be assigned to this project to receive "hands-on" experience in carrying out a natural resources inventory, making environmental assessments, and using simulation models for determining development policy. One counterpart will receive training in computer programming and modeling while the other will be trained in integrated natural resource data storage and manipulation. These individuals will play a key role in continuing the CRDP activities beyond the life of the project. Their qualifications should include a university degree in a relevant discipline and a commitment to continue in the role for which they are trained.

The GOR counterpart to the ETMA CRDP Project Field Director, i.e., the Office Director of the Environmental Affairs Office that serves as secretariat to the coordinating body, will be eligible for one semester of overseas training on integrated natural resource management.

The project will also train three GOR personnel (two from the Ministry of Education and one from the Ministry of Social Affairs) in the on-going development of environmental education.

Counterparts for the socio-economic, physical, and biosphere data collection process will also be trained.

In addition to on-the-job training this project will finance:

1. Seminars and workshops organized around specific environmental issues in the Ruhengeri prefecture. These seminars will provide some technical training for local government officials.
2. One large nationwide seminar bringing together Ruhengeri officials and representatives from central government agencies in Kigali.

3.2.1.3 Core Project: Introduction of Methodology into the GOR Decision-Making Process

The success of this project will be judged by the ultimate utility the developed methodology provides for the government in its decisions on development and the environment. The objective of this project during its implementation is to make certain that the methodology it develops is used and that it demonstrates proof of its utility. Factors critical to this significant development step are:

1. Necessity of a coordinating body: The importance of such a mechanism cannot be overstated. The pre-project seminar is key to airing the GOR's intentions to create such a body.
2. Presentation of project findings: When the project reaches the stage of identifying environmental trends in the Ruhengeri prefecture, these findings will be presented to a coordinating body in the form of an interim report. This step will constitute the first major decision the body will have to make and will consist of determining which negative trend deserves priority. Once this determination is made, it must decide what steps should be taken to mitigate the trend (i.e., Umuganda campaign, formulation of special donor projects to address the problem, education campaign, etc.) and seek formal approval to proceed with the solution.
3. Seeking other Donor Funding: If other donor funding is sought to participate in a clean up or other action to mitigate a serious environmental problem, the project can aid the GOR in formulating such a request. It is in the formulation of this request and the subsequent GOR procedures (i.e., review by Ministry of Plan or other) that the concepts of integrated natural resource management as a necessary consideration in the elaboration of development projects will have their exposure in the true government decision-making process. If funding falls under the purview of the Ministry of Health (i.e., a water supply system in Ruhengeri), this sub-project should reflect the interconnection with forestry, water, lakes, fish, urban services, etc., and the project should identify the best way to proceed with the minimum of resource degradation.

4. Providing data to donor agencies: The data collected on the resources in a given area should be reliable and available to all donors designing projects in-country. Project personnel and the GOR members of the coordinating body should actively seek to inform potential donors of the project's findings.
5. Providing data to individual ministries: Individual ministries are usually the initiators of development projects with their counterpart donor. These ministries will have representatives on the coordinating body, and these representatives should be privy to upcoming project plans. Trends and other project findings that might affect the outcome of such ministry planning (e.g., a road or mining project) should have the benefit of scrutiny by the environmentally minded.

### 3.2.2 Core Project: Increased Public Awareness of Environmental Problems

The second major portion of the core project implementation is aimed at creating an informed public that is capable of implementing local strategies of sound natural resource management. This part of the CRDP is geared to generating a "bottom-up" approach to integrated natural resource management and will concentrate on reaching the public through the following ways:

1. The formal education system as the most viable method for disseminating environmental and resource management information to Rwanda's youth;
2. The non-formal education institutions which will provide training in skills to enhance rural and agricultural life of a wide spectrum of the rural population; and
3. Demonstration projects using the other donor projects to demonstrate appropriate techniques in resource management.

The basic environmental themes to increase public awareness will depend on the findings of the inventory and environmental assessment. Therefore, the activities of the education campaign, in order to appropriately address real issues in the Ruhengeri prefecture will begin roughly one year after the project has started.

#### 3.2.2.1 Core Project: Formal Education Campaign

The program for developing curricula and materials on environmental issues for the formal education system will be closely associated with an existing environmental education program known as NATENRWA which has already been successfully instituted in the secondary education curriculum.

ETMA will fund an environmental education specialist for two months. The specialist will inventory and evaluate existing environment-related courses and materials and then design a comprehensive environmental education program leading from primary school to completion of secondary schools. The comprehensive environmental program should be based on

the findings of the integrated natural resources management trend analysis and assessment and should be submitted to the project coordinating mechanism for advice.

After a formal environmental education program has been approved by the Ministry of Education, the Peace Corps will provide one field level curriculum advisor to actually develop curriculum and classroom materials for the primary, CERAI, and secondary institutions.

At the end of the volunteer's tour of duty, there should be developed a variety of written materials, films, slide shows, posters, and other audio-visual aids to enhance and support classroom instruction.

### 3.2.2.2 Core Project: Non-Formal Education Campaign

The long-term objective of education and training through non-formal institutions is to increase the knowledge among rural Rwandans of the natural resource conservation strategies and practices. The Government of Rwanda has recently begun an effort to develop a network of non-formal education institutions which will provide training in skills to enhance rural and agricultural living. These institutions, the Centres Communaux de Developpement et de Formation Permanente, will offer, when implemented, an excellent opportunity to disseminate information to develop public understanding of natural resource conservation strategies. ETMA proposes to provide funding and technical assistance to develop curricula and materials on environmental issues for the CCDFP's and other non-formal education institutions.

The non-formal education program will be implemented through the non-formal education institutions (e.g., CCDFP's) to reach people who do not take part in either the formal or non-formal institutions. They are the burgomeisters, sector representatives, informal groups of men and women organized for self-help (umuganda) and informal church groups. With the technical assistance planned below, it is hoped that the non-formal program will be primarily implemented by Rwandans.

Personnel for the non-formal education program will be:

1. The environmental curriculum specialist will inventory existing non-formal environmental and natural resource management materials presently used. The specialist will make recommendations concerning the development of short courses, audio-visual aids, and the like for public presentation in the rural areas; and
2. A non-formal education curriculum advisor, a graduate student, will be at the associate expert level and will work with the Ministry of Social Affairs to develop the actual programs for non-formal education institutions. The advisor will coordinate closely with his/her counterparts in the Ministry of Primary and Secondary Education curriculum development units as well as with the NATENRWA in presenting environmental films in rural areas.

The CRDP project office should provide office space for the short-term curriculum advisor and the Peace Corps volunteer, unless the BPES and BEPE are able to provide space. GOR agreement on using the Peace Corps volunteer for this portion of the project should also be a pre-condition to approving this project.

### 3.3 Adjunct Project Activities

The original intent of the CRDP was to generate cooperation with other donors in Rwanda in order to promote a fairly unified environmental strategy. The adjunct project activities defined below are designed to complement the core project activities in their achievement of the two project purposes. These activities are essentially demonstrations of the resource management techniques and strategies promoted in the core project or actions to mitigate grave environmental problems.

There are three categories of adjunct project activities all of which require other donor participation:

1. Cooperation with AID bilateral projects in the Ruhengeri prefecture;
2. Co-financing with another donor; and
3. Associated projects identified by the ETMA core project and designed to mitigate critical problems, but financed entirely by another donor.

#### 3.3.1 Cooperation with the AID Bilateral Program in the Ruhengeri Prefecture

The CRDP will work with three AID projects yet to be implemented in Ruhengeri in order to demonstrate ecologically sound procedures for implementing agro-forestry, appropriate technology and more intensive crop production.

##### 1. USAID Agro-Forestry Project

The agro-forestry project will concentrate on planting trees on farms in three communes over a three-year period beginning in Cyeru commune. It is estimated that Buberka now has about 30 trees per hectare but can support up to 300. The project will rely on the farmers themselves to plant seedlings on their land and to nurture and maintain them. Training will be given to these farmers in tree planting and maintenance techniques. Personnel of the Rwandan forestry department (Eaux et Forêts) will also receive on-the-job training in agro-forestry, tree management, harvesting, tree utilization and design of improved wood burning stoves.

The CRDP can participate in this project by giving supplementary training to participating extension workers and farmers in the areas of environmental awareness, integrated resource management, and soil improvement.

## 2. The USAID Cropping System Improvement Project

The cropping system improvement project has as its ultimate goal the increase of crop yields per hectare in Rwanda. The CRDP on the other hand, has as its ultimate goal the preservation of a natural environment capable of supporting human, social and economic progress without destroying the ecological fabric essential to maintain development. To this end the CRDP will strive to bring about public awareness in Ruhengeri of the inter-relatedness of agricultural development and environmental preservation.

The final design of the Cropping Systems Improvement Project will take place during the fall of 1983. This will allow the USAID mission to incorporate the suggestions stated below into the project paper.

As CRDP activities get underway in the Ruhengeri prefecture, final approval should be near for this important sixteen million dollar, five year cropping systems improvement project in Buberuka sub-prefecture. By the time the cropping systems project is implemented, the data gathering phase of the CRDP should be completed. This will allow the cropping systems team to draw on the CRDP's extensive physical, biological, and human resource inventory and survey work by the CRDP.

Stage 1 of the cropping systems project is that of description or diagnosis to identify production constraints and potential for improvement. Since much of the natural and human resource data compiled and analyzed by the CRDP will apply to the area of Buberuka, especially Cyeru commune, the farming systems team can move quickly to Stage 2, the design of appropriate solutions to production problems.

During Stage 2 solutions will be designed that will address issues related to increasing crop yields, particularly those related to soil erosion and fertility, terracing techniques, water supply, appropriate technology, and agro-forestry mixes. The integrated resource management approach developed by the CRDP core project will aid the cropping system team to develop multi-faceted farm trials for Stage 3 of the project.

During Stage 3 on farm demonstrations of new technologies will be conducted under the supervision of the farming systems team and local extension agents. The CRDP will participate at this stage by monitoring environmental effects of these trials and by incorporating integrated resource management concepts in the training of the farmers and extension agents.

Stage 4 is that of extension of relevant new technologies to farmers throughout the sub-prefecture (communes of Cyeru, Butaro, and Nyamugali). This crucial phase of project activities relies very heavily on Rwandan extension agents at the commune and sector level.

These extension agents and their supervisors will be considered members of the cropping systems team and will participate in training sessions to learn new agricultural technologies, will conduct training with farmers, and will help manage on-farm demonstration trials. The CRDP can participate in the training of the agents by conducting courses on environmental problems, trends, and solutions. Thus when the agents turn to teaching farmers and managing on-site testing of new technologies, they will also impart an integrated approach to the solution of farm production problems.

As part of its local-level training of farmers and government officials in environmental management and conservation, the CRDP will present short courses in agro-forestry and appropriate technology in order to integrate these upcoming USAID projects in eastern Ruhengeri with the major cropping systems improvement effort.

A small adjunct to the farming systems project is a program of communal public works, including the expansion of communal water supplies and the improvement of rural roads. The CRDP will carefully monitor the environmental effects of these programs and will conduct training of communal officers and local workers as appropriate to mitigate undesirable environmental consequences.

### 3.3.2 Co-Financing with Another Donor

This category of adjunct project activities involves two forms of other donor participation: (1) co-financing of some parts of the core project or (2) co-financing actions that require immediate attention if critical trends are identified during the trend analysis.

Although ETMA assures financing for the core project, it will invite other donor financing for parts of the core. All funds "saved" could be re-budgeted to demonstration or direct mitigation actions.

#### 1. Co-Financing Parts of the Core Project

Representatives of several international and U.S. organizations have already indicated a willingness to participate and support the CRDP. Once the core project begins to recruit short-term technical assistance for the various sub-teams, ETMA will request other donors to supply qualified experts to serve on these teams. Representatives of several international and U.S. organizations have already indicated a willingness to participate and support the CRDP. These include:

- a. UNESCO Man and the Biosphere Program (MAB)
- b. The U.S. National Academy of Sciences, Board on Science and Technology for International Development (BOSTID)
- c. AID's project Energy Initiatives for Africa (AID 698-0424)
- d. The AID National Park Service Project on Forestry Management Services
- e. SECID's project on Women in Development

- f. U.S. Peace Corps
- g. African Wildlife Foundation
- h. AID-Regional Remote Sensing Facility, Nairobi

The first such co-financing arrangement might be the UNESCO-MAB participation in the pre-project seminar.

Another co-financing arrangement might be the logistical support which the ETMA CRDP field office can lend to other donor activities already in the field. In exchange for this support, other donor findings and data will be integrated into the CRDP data base. The following are examples of such co-financing arrangements:

- a. There is currently a mountain gorilla project funded by a consortium of wildlife conservation interests where valuable wildlife and vegetation data are being gathered. ETMA could provide local logistic support costs (i.e., per diem and transportation) for this team to collect data for the project's inventory.
- b. Currently connected to the University of Rwanda Campus in Ruhengeri is a meteorologist, who, with some funding of local costs could conduct stream gauging and collect meteorological data of the Virungas.
- c. A technical assistance fisheries team is currently conducting a study of Lake Kivu's fishery potential. They would be willing to do likewise in Lake Bulera for local support costs.

## 2. Co-financing of critical problem areas

As the ETMA core project identifies important negative trends, the GOR coordinating mechanism will review then identify the priority actions needed. At this point, ETMA staff and the GOR should determine if cost-saving actions can be taken to mitigate some trends and if donors already in the area can lend their resources to solve the problem. In other words, this co-financing arrangement would involve the GOR resources such as the umuganda, other donors already in the field, and some of ETMA's field survey funds.

The following is an example of a co-financed project:

### ° The Kinigi Agro-Forestry Project

Kinigi commune is a densely populated area bordering the Parc National des Volcans in the Virunga ecosystem. Due to a shortage of bamboo outside the national park boundaries, a significant proportion of the local population is forced to illegally exploit the park to satisfy basic needs for fuelwood and bamboo. In addition, Kinigi suffers from seasonal shortages of water common to the lava zone, and pressure to exploit water sources within the park is growing.

The ETMA core project will carry out an extensive field socio-economic survey of the local population's uses of the Virunga ecosystem and their perceptions of forest, wildlife, and hydrological values. Based on the outcome of this survey, a project will be elaborated for other donor co-financing to demonstrate an integrated approach to the management of fuelwood and bamboo resources in Kinigi commune. Such a demonstration project would also make use of the public education and extension programs developed as part of the overall CRDP education campaign as well as the Swiss, German, and World Bank project personnel in the area.

Specific outputs of the Kinigi Agro-forestry project would be:

- a. The development and implementation of an effective management plan for sustained yield exploitation of the existing communal bamboo plantation plots;
- b. The extension of appropriate technologies for the integration of fuelwood and bamboo species within existing or modified cropping systems on private lands; and
- c. The introduction and extension of improved wood stove technologies in the area to help reduce demand on existing wood supplies.

The final design of this project depends on the outcome of core project surveys. The Kinigi project should start during the second year of the CRDP. A project coordinator will be required to oversee the project and would be financed by another donor. The approximate cost of the donor financing is \$60,000 for two years.

### 3.3.3 Associated Projects Identified by the ETMA Core

Associated projects require fairly extensive resources for capital improvement such as water supply systems, public health sanitation, drainage canals, modification of road beds and the like. The ETMA core project will generate the technical and human resources for requesting such a project within the context of an overall integrated resource management effort.

Again, after the extensive inventory has been carried out of the prefecture's natural resources and an assessment is made of the negative trends, the coordinating body will decide which critical problems must be dealt with first. Actions requiring large outlays will be elaborated into technical requests for funds. These requests will then be presented to the donors by the GOR.

Some possible areas which might be affected by this type of financing and which the design team was able to identify are as follows:

1. Possible pollution of Lake Bulera due to mining. Pollution may account for the significant reduction of the fish population reported by fishermen.

2. Reported presence of schistosomiasis in Lake Ruhondo.
3. Possible connection between pisciculture and increased incidence of malaria.
4. Urban pressures in Ruhengeri town and overtaxing sanitation and water supply capability.
5. Problems of sanitation in the Lava regions.
6. The need for an environmental impact study for a wetlands project.
7. Effect of increased tourism in the National park area.

3.4 TENTATIVE CRDP IMPLEMENTATION SCHEDULE

Project Personnel	Month																																				
	5	4	3	2	1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29		
Project Field Director																																					
Pre-project Seminar Establishing GOR Co- ordinating Mechanism																																					
Set up office and purchase equipment																																					
Install Computers																																					
Computer Specialist																																					
Socio-economic Study																																					
Agricultural Economist																																					
Social Anthropologist																																					
Epidemiologist																																					
Water Resource Engineer																																					
Soil Scientist																																					
Agro-forestry Special.																																					
Wildlife Mgmt. Spec.																																					
Environmental Education Specialist																																					
Non-formal Education Advisor																																					

TENTATIVE CRDP IMPLEMENTATION SCHEDULE cont.

Project Personnel	Month																																				
	5	4	3	2	1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29		
Curriculum Advisor (PC)																																					
Trend Analyses																																					
Presentation of Initial Findings (Interim Rpt.)																																					
Elaboration of Other Donor Projects																																					
Work with AID Project Design Efforts																																					



4.0 CRDP RWANDA BUDGET SUMMARY

	FY 83-84	FY 84-85	FY 85-86
Technical Assistance:			
Professional			
Long-term and Short-term	\$268,214	\$279,074	\$ 239,752
Related costs to studies	<u>73,040</u>	<u>6,000</u>	<u>14,900</u>
Subtotal	341,254	285,074	254,652
Materials & Commodities			
Vehicles (3)	34,000	17,000	
Motor Scooter		1,500	
Computer Hard & Software	31,000		1,000
Water Analysis Equip.	2,300		
Misc.	5,000		
Educational Equip. & Materials	<u>          </u>	<u>5,500</u>	<u>2,000</u>
Subtotal	72,300	24,000	3,000
Training			
U.S.		12,000	
Seminars (in-country)	4,000	4,000	20,000
Per Diem	<u>15,000</u>	<u>5,000</u>	<u>10,000</u>
Subtotal	19,000	21,000	30,000
Project Evaluation		20,000	
Operating Expenses			
Project Office	<u>41,000</u>	<u>64,000</u>	<u>55,000</u>
TOTAL	\$473,554	\$ 414,074	342,652
GRAND TOTAL			\$1,230,280

4.1 Detailed Budget RWANDA CRDP: FY 83-84

<u>COST ITEM</u>	<u>LEVEL OF EFFORT</u>	<u>COST</u>
Salaries		
Professional		
Long-Term		
Country Coordinator	11	\$ 29,333
Curriculum Advisor		-
Short-Term		
Computer Specialist	2.5	11,550
Agricultural Economist	2	9,240
Social Anthropologist	4	18,480
Epidemiologist	2	9,240
Water Resources Engineer	2	9,240
Soil Scientist	1	4,620
Agro-forestry	1	4,620
Wildlife Mgmt. Specialist	1	4,620
Environmental Educ. Advisor		-
Non-Formal Educ. Advisor		-
Non-Professional		
Administrative Assistant		2,500
Driver		2,500
Other		5,000
Subtotal		<u>\$110,943</u>
Fringe		
Professional		
Long-Term		
Country Coordinator		\$ 9,387
Short-Term		
Misc. Consultants		10,395
Subtotal		<u>\$ 19,782</u>
Overhead		
Misc. Consultants		\$ 17,325
Subtotal		<u>\$ 17,325</u>

<u>COST ITEM</u>	<u>LEVEL OF EFFORT</u>	<u>COST</u>
<b>Travel</b>		
Domestic		
Consultant Briefings/Debriefings		\$ 5,400
Advisory Committee		3,000
International		
Country Coordinator		4,500
Consultants (10)		22,400
In-Country		20,000
Transportation - Household Effects		4,650
Excess Baggage		
Country Coordinator		555
Consultants		1,480
Storage		
Monthly		540
In/Out		710
Air Freight		
Country Coordinator		3,019
Equipment		<u>12,000</u>
Subtotal		\$ 78,254
<b>Allowances</b>		
Per Diem		
Domestic		
Consultants Briefing/Debriefings		\$ 1,800
Advisory Committee		1,000
International		
Country Coordinator-posting		200
Consultants		31,500
In-Country - Country Coordinator		6,720
Post Differential		4,000
Post Allowance		690
Quarters		<u>6,000</u>
Subtotal		\$ 51,910
<b>Other Direct Costs</b>		
Commodities and Materials		
Vehicles (2)		\$ 34,000
Computer hardware		21,000
Computer software		10,000
Water quality analysis equipment		2,300
Environmental educ.		
equipment		-
motor scooter		-
Miscellaneous		5,000
Related costs to Technical Assistance		
Socio Econ Study		33,040
Public health		10,000
Water quality		25,000
Biosphere		5,000
Operating		
Office Equipment		8,000
Office Rent		8,000
General		<u>15,000</u>
Subtotal		\$176,340

<u>COST ITEM</u>	<u>LEVEL OF EFFORT</u>	<u>COST</u>
Training		
U.S. training		\$ -
In-Country Seminars		4,000
Per Diems for government counterparts in training		15,000
Subtotal		<u>\$ 19,000</u>
TOTAL		\$473,554

4.2 Detailed Budget Rwanda CRDP: FY 84-85

<u>COST ITEM</u>	<u>LEVEL OF EFFORT</u>	<u>COST</u>
Salaries		
Professional		
Long-Term		
Country Coordinator	12	\$ 32,000
Curriculum Advisor (Peace Corps)	12	-
Short-Term		
Computer Specialist	1.5	6,930
Agricultural Economist	.5	2,310
Social Anthropologist	2	9,240
Epidemiologist	1	4,620
Water Resources Engineer	2	9,240
Soil Scientist	1	4,620
Agro-forestry	1	4,620
Wildlife Mgmt. Specialist	1	4,620
Environmental Educ. Advisor	2	9,240
Non-Formal Educ. Advisor	6	12,000
Non-Professional		
Administrative Assistant		5,500
Driver		5,500
Other		10,000
Subtotal		<u>\$120,440</u>
Fringe		
Professional		
Long-Term		
Country Coordinator		\$ 10,240
Short-Term		
Misc. Consultants		9,009
Subtotal		<u>\$ 19,249</u>
Overhead		
Misc. Consultants		\$ 15,015
Subtotal		<u>\$ 15,015</u>

<u>COST ITEM</u>	<u>LEVEL OF EFFORT</u>	<u>COST</u>
<b>Travel</b>		
<b>Domestic</b>		
Consultant Briefings/Debriefings		\$ 4,500
Advisory Committee		3,000
<b>International</b>		
Country Coordinator		2,800
Consultants (10)		28,000
In-Country		23,000
Transportation - Household Effects		-
<b>Excess Baggage</b>		
Country Coordinator		-
Consultants		1,850
<b>Storage</b>		
Monthly		1,080
In/Out		-
<b>Air Freight</b>		
Country Coordinator		-
Equipment		6,000
Subtotal		<u>\$ 70,230</u>
<b>Allowances</b>		
<b>Per Diem</b>		
<b>Domestic</b>		
Consultants Briefing/Debriefings		\$ 1,500
Advisory Committee		1,000
<b>International</b>		
Country Coordinator-posting		-
Consultants		36,540
In-Country - Country Coordinator		6,720
Post Differential		8,000
Post Allowance		1,380
Quarters		20,000
Subtotal		<u>\$ 75,140</u>
<b>Other Direct Costs</b>		
<b>Commodities and Materials</b>		
Vehicles		\$ 17,000
Computer hardware		-
Computer software		-
Water quality analysis equipment		-
<b>Environmental educ.</b>		
materials		1,000
equipment		4,500
motor scooter		1,500
<b>Miscellaneous</b>		
-		-
<b>Related costs to Technical Assistance</b>		
Public health		1,000
Water quality		-
Biosphere		5,000
<b>Operating</b>		
Office Equipment		12,000
Office Rent		16,000
General		15,000
Subtotal		<u>\$ 73,000</u>

<u>COST ITEM</u>	<u>LEVEL OF EFFORT</u>	<u>COST</u>
Mid-term Project Evaluation		<u>\$ 20,000</u>
Subtotal		\$ 20,000
Training		
U.S. training		\$ 12,000
In-Country Seminars		4,000
Per Diems for government counterparts in training		<u>5,000</u>
Subtotal		<u><u>\$ 21,000</u></u>
TOTAL		\$414,074

4.3 Detailed Budget Rwanda CRDP: FY 85-86

<u>COST ITEM</u>	<u>LEVEL OF EFFORT</u>	<u>COST</u>
Salaries		
Professional		
Long-Term		
Country Coordinator	12	\$ 32,000
Curriculum Advisor (Peace Corps)	12	-
Short-Term		
Computer Specialist	1.5	6,930
Agricultural Economist	.5	2,310
Social Anthropologist	2	9,240
Epidemiologist	1	4,620
Water Resources Engineer	1	4,620
Soil Scientist	1	4,620
Agro-forestry	1	4,620
Wildlife Mgmt. Specialist	1	4,620
Environmental Educ. Advisor	-	-
Non-Formal Educ. Advisor	-	-
Non-Professional		
Administrative Assistant		6,000
Driver		6,000
Other		12,000
Subtotal		<u>\$ 97,580</u>
Fringe		
Professional		
Long-Term		
Country Coordinator		\$ 10,240
Short-Term		
Misc. Consultants		<u>7,623</u>
Subtotal		<u>\$ 17,863</u>
Overhead		
Misc. Consultants		<u>\$ 12,705</u>
Subtotal		<u>\$ 12,705</u>

<u>COST ITEM</u>	<u>LEVEL OF EFFORT</u>	<u>COST</u>
Travel		
Domestic		
Consultant Briefings/Debriefings		\$ 3,000
Advisory Committee		3,000
International		
Country Coordinator		4,500
Consultants (10)		28,000
In-Country		20,000
Transportation - Household Effects		4,650
Excess Baggage		
Country Coordinator		555
Consultants		1,850
Storage		
Monthly		1,080
In/Out		710
Air Freight		
Country Coordinator		3,019
Equipment		3,000
Subtotal		<u>\$ 73,364</u>
Allowances		
Per Diem		
Domestic		
Consultants Briefing/Debriefings		\$ 1,000
Advisory Committee		1,000
International		
Country Coordinator-posting		200
Consultants		23,940
In-Country - Country Coordinator		6,720
Post Differential		8,000
Post Allowance		1,380
Quarters		20,000
Subtotal		<u>\$ 62,240</u>
Other Direct Costs		
Commodities and Materials		
Vehicles		\$ -
Computer hardware		-
Computer software		1,000
Water quality analysis equipment		-
Environmental educ.		
materials		2,000
equipment		-
motor scooter		-
Miscellaneous		-
Related costs to Technical Assistance		
Socio. Econ. Study		9,900
Public health		-
Water quality		-
Biosphere		5,000
Operating		
Office Equipment		-
Office Rent		16,000
General		15,000
Subtotal		<u>\$ 48,900</u>

<u>COST ITEM</u>	<u>LEVEL OF EFFORT</u>	<u>COST</u>
Training		
U.S. training		\$ -
In-Country Seminars		20,000
Per Diems for government counterparts in training		10,000
Subtotal		<u>\$ 30,000</u>
TOTAL		\$342,652

#### 4.4 Explanatory Notes of CRDP Budget

Our Life-of-Project cost estimate assumes that implementation of the CRDP will begin in March 1984, and that a Country Coordinator will be assigned to post in Kigali by April. Other assumptions for the implementation phase include the need for project vehicles, an office in Kigali, and consultant time in-country to begin project activities in Ruhengeri Prefecture, plus development time in the United States prior to implementation for the Country Coordinator and the consultants.

##### 1. Salaries

- a. Country Coordinator - It is assumed that a project director for the Ruhengeri Prefecture project will be required to coordinate activities in Rwanda. We have anticipated that an individual will be hired in November 1983 and be assigned to Kigali beginning March 1984. Monthly salary is estimated to be \$2,667.
- b. Short-Term Consultants - Forty-two and one-half (42.5) months level of effort have been estimated for short-term consultants to work on the project beginning in July 1984 at a monthly salary of \$4,600. These months are scheduled as 15.5 months in FY 83-84, 18 months in FY 84-85, and 9 months in FY 85-86.
- c. Non-Professional - We have estimated 30 months of Administrative Assistant time, 30 months of a Driver, and other support personnel for the Country Coordinator at a total of \$55,000.

##### 2. Fringe Benefits

The current fringe benefit rate for SECID of 32% of salary was applied to the Country Coordinator. A fringe rate of 30% of salary was applied to selected consultants.

##### 3. Overhead

Overhead for some selected consultants is calculated at 50% of salary.

##### 4. Travel/Per Diem

###### a. Domestic

1. Consultant briefings/debriefings have been budgeted at \$450 per trip.
2. Travel for five individuals to attend an Advisory Committee meeting in Chapel Hill has been budgeted at \$200 per trip.

b. International

1. The travel to post and back by the Country Coordinator with dependents has been budgeted at \$1,500 per trip per individual. Some travel in East Africa is also included.
  2. A total of thirty (30) round trips by consultants have been estimated at \$2,614 per trip. Consultants per diem in Rwanda is estimated at \$84.
  3. In-country ground transportation has been estimated at \$63,000.
- c. Transportation of Household Effects - We have used a rate of \$310 per 100 pounds for the transportation of 2,500 pounds of effects for the Country Coordinator.
- d. Excess Baggage - We have used a rate of \$185 for excess baggage for each individual going overseas including the Country Coordinator and dependents.
- e. Storage - The estimate includes 30 months storage at \$90 per month for the Country Coordinator. An additional \$710 is budgeted for crating and handling of the household effects.
- f. Air Freight - We have estimated air freight one way at \$1,258 for 250 pounds for the Country Coordinator, \$1,006 for the 200 pounds allowed for the first dependent, and \$755 for 150 pounds for the second dependent. The same rates were applied for the return.

5. Allowances

- a. Post Differential - Post differential is calculated at 25% of overseas base salary for the long-term Country Coordinator.
- b. Quarters - Quarters have been estimated at \$1,000 per month for the Country Coordinator. The additional quarters allowance is for the curriculum advisor.
- c. Post Allowance - A post classification of 10 is allowable for Kigali.

6. Other Direct Costs

- a. Project Vehicle - We have estimated \$51,000 for the purchase of three project vehicles.
- b. Computer Hardware/Software - We have estimated \$32,000 for the purchase of a computer and associated software.
- c. Water Quality Equipment - We have estimated \$2,300 for purchase of equipment to perform water quality analyses.
- d. Technical Assistance Costs - Costs associated with individual studies are budgeted at \$93,940.
- e. Office Rental - We have estimated \$40,000 for office rental in Kigali for 30 months.

## 5.0 ADMINISTRATION OF THE PROJECT: ORGANIZATIONAL RELATIONSHIPS AND RESPONSIBILITIES

The management of this project involves three principal parties: (1) AID Washington, (2) The South-East Consortium for International Development, SECID, and its Africa-wide project, ETMA, and (3) the Government of Rwanda. The relationships between these three parties is represented in Figure 5A below.

### 5.1 Stateside Responsibilities

#### 5.1.1 AID/Washington

AID/W is the original source of funding for this project. AID has contracted SECID to elaborate and administer the Environmental Training and Management in Africa project or ETMA. ETMA is funded from AID's central funds and is therefore separate from AID bilateral development programs. AID/W does not need to formally approve this project. It does, however, require that the design of this project be acceptable for purposes of requesting central funding.

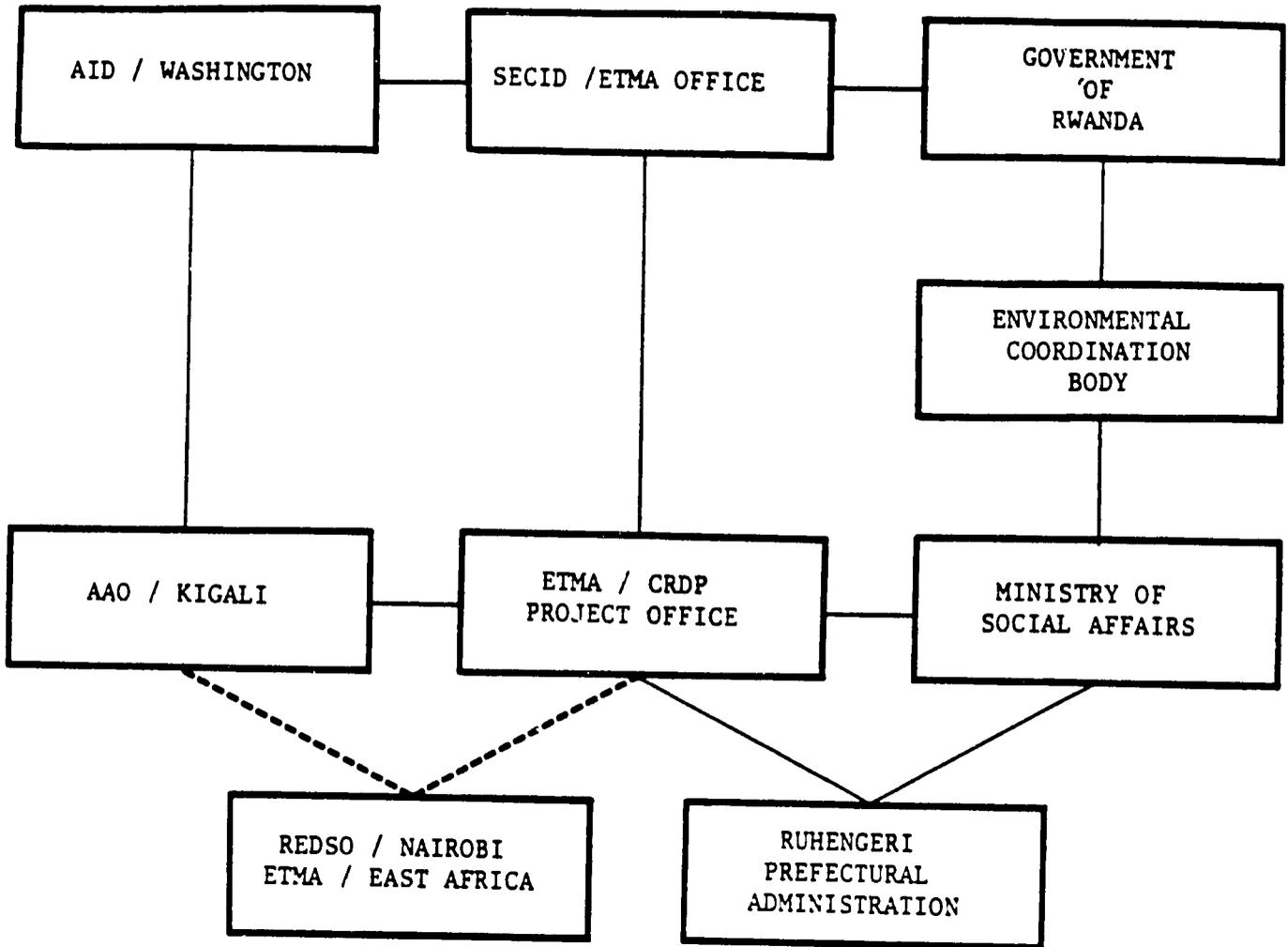
#### 5.1.2 SECID or the South-East Consortium for International Development

SECID through its project ETMA will provide the U.S. backstopping for this project. SECID/ETMA's responsibilities are the following:

1. To draw up the final document of agreement between the GOR and SECID outlining this project and mutual responsibilities of this project.
2. To assure that this project is both conceptually and procedurally executed in conformity to the above agreement.
3. To be responsible for technical guidance and periodic evaluation of the project's progress. This involves briefings and coordination with AID when modifications of the original project design are necessary. Decisions regarding technical activities, modifications of project design and evaluation will be reviewed with the in-country project director.
4. To field all long-term and short-term personnel. This requires advertising, recruiting, qualifying, briefing, and contracting personnel according to the needs and timing requested by the ETMA project office in Kigali. Special attention should be given to adequate French language capability of all personnel hired. An FSI rating of at least 3 should be required.

Figure 5A

ETMA / CRDP PROJECT MANAGEMENT RELATIONSHIP



————— Responsive to or contractual  
- - - - - Technical or advisory

5. To procure most material needed to support the field project office including foreign-made automobiles which will require procurement waivers.
6. To determine the suitability of all training programs planned for in the U.S. and to set up any special training sessions in the U.S. for Rwandan participants. Backstopping of this function requires the proper facilities to receive, feed, and lodge participants.
7. To make annual budget requests to AID based on the project's progress and financial pipeline.
8. To channel AID funds and account for their use. This responsibility requires annual audits of all project accounts, including in-country books. In order that the accounting systems in the field and U.S. offices be compatible, SECID must set up the accounting system, making it conform to both the U.S. and Rwandan banking systems. SECID auditors and accountants must demonstrate a capability to read French before handling the project books.
9. Create a revolving fund to supply the field office with adequate access to project funds. Since there are many layers through which these funds must pass, the most expeditious method possible is required (i.e., letter of credit to a U.S. bank with a correspondent bank in Brussels which in turn has a correspondent in Kigali). Because of the relatively poor communications between Rwanda and the U.S., the most flexible procedures should be adapted, with the field office having reasonable discretionary powers. The project director in-country should determine a yearly operating budget and allocate accordingly on a reimbursable basis.

SECID will also retain the services of the original CRDP design team to advise SECID on implementation and to brief specialists going to the field. In addition the original team may from time to time serve in the field to assure smooth implementation of the project.

## 5.2 In-Country Responsibilities

### 5.2.1 Role of the AID Affairs Office

Although the project is funded from AID central funds (as opposed to direct bilateral aid), the AID Affairs Office in Kigali will retain direct responsibility to AID concerning this project. The AID office is therefore ultimately responsible for the proper execution of the CRDP. It will be involved in all high level contacts with the GOR, especially the establishment of an adequate coordinating body for this project, presentation of the major findings of the project to the upper levels of the GOR, and contacts with the international development community for further investments in the field of environment.

Administratively, the AID office will facilitate the establishment of the ETMA project office, prepare the clearances for Peace Corps involvement in the project, and assist in drafting the SECID/GOR agreement in line with AID regulations.

The AID office will also actively involve the ETMA project members in the design of other AID projects contemplated for the Ruhengeri area.

#### 5.2.2 SECID/ETMA Office in Nairobi

This office will primarily be responsible for organizing the pre-project seminar on this project using existing ETMA funds. In conjunction with SECID and the AID Affairs Office, this office will draft the terms of reference of the seminar and the letter of agreement with the GOR to organize the seminar.

This office will function as ETMA's field office in Rwanda until the project has been approved and an ETMA office has been set up in Kigali. For this reason, the Nairobi ETMA office will be primarily responsible for drawing up and having executed the general agreement between SECID and the Government.

#### 5.2.3 The ETMA CRDP Project Field Office

By far, this office bears the major responsibility for the proper execution of the CRDP core project as well as some co-financed portions. It is the chief executor of the CRDP.

The office's functions are:

1. To serve as the technical arm of the GOR environmental office in the Ministry of Social Affairs in coordinating eight ministries and Ruhengeri prefecture officials to assure that all project elements are properly executed in the field;
2. To work closely with the SECID office to assure that all necessary technical personnel are fielded in a timely manner to carry out the series of tasks outlined in the project;
3. To draw up the findings of the technical studies for presentation by the environmental office to the coordinating body;
4. To train designated government counterparts in all functions of the office;
5. To qualify and help select GOR participants for U.S. training;
6. To organize in-country training seminars and conferences;
7. To work closely with the designated environmental affairs office to set up a viable coordinating mechanism for the project and then for environmental affairs in general;

8. To provide necessary logistic support to all short- and long-term personnel needed to execute the project;
9. To make all necessary arrangements to coordinate activities with other donors already in the field, especially AID; and
10. To aid the GOR in drawing up technical documents as part of their request for other donor financing of mitigating actions required by ETMA project's findings.

This field office should be considered a temporary mechanism through which the CRDP project elements are executed. The office is not meant to become an entity in and of itself but must "self-destruct" as the project functions are gradually merged into the GOR environmental affairs office.

The project office is also expected to keep clear and accurate records of all project expenditures.

Staffing requirements for the office are as follows:

- Project Field Coordinator
- Administrative Assistant/Typist
- Part-Time Accountant
- Driver/Mechanic

The project field coordinator reports to the ETMA office at SECID headquarters in Chapel Hill, North Carolina. The project field coordinator serves two major functions: (1) the substantive and technical head of the office as well as (2) the manager of the office. His or her role must always be considered a development role of promoting useful changes in the GOR's management of its resources. The training of designated government counterparts in the project office is primordial and every effort should be made by the coordinator to divest himself of as many duties as possible once the trainees are able to assume the responsibility. The coordinator's role as manager is secondary although critical.

The project field coordinator is supported by a Rwandan administrative assistant who must coordinate the logistics of the office and perform general secretarial work.

A part-time accountant will also be required to keep the fiscal records in order, by keeping a journal of expenses, issuing monthly financial statements on the status of project funds based on the balancing of the books and reconciliation of the various local bank accounts.

The driver should be in charge of keeping the project vehicles in good order and hiring temporary drivers when the need arises.

In addition, the project coordinator should have enough discretionary power to hire added local administrative help as well as local qualified consultants who might perform some of the technical work.

### 5.3 Government of Rwanda Responsibilities

The primary concern of the GOR is the institutionalization of integrated resource management into development decision-making. In order that this be carried out, the GOR must assure the following:

1. Active participation in the pre-project seminar by assuring the participation of at least the Office Directors of the various ministries involved.
2. Organization of a coordinating body for environmental affairs.
3. Assignment of qualified counterparts to work in the project office with assurances that these same, if proven worthy, will take over the project's functions as part of the government bureaucracy.
4. Formal assignment of an official secretariat for the coordinating committee into which the ETMA project office will be merged. The project field office will consider the Office of Family and Environment of the Ministry of Social Affairs its official counterpart until otherwise directed.

### 5.4 Project Evaluation Procedures

There will be a mid-term project evaluation, preferably after the eighteenth month of actual project implementation, for the purposes of adjusting the activities projected in this project document to the realities encountered during the first year of implementation. The evaluation team will consist of experts from outside the SECID/ETMA CRDP activity. Based on the qualitative and quantitative inputs and outputs outlined in the logical framework, the evaluation team and the advisory board should work with the project field office and the GOR to assess the project's progress.

In addition to this project evaluation, a socio-economic evaluation is planned, during the last six months of the CRDP, to examine the effectiveness of all educational training, outreach and demonstration projects conducted in the areas of initial socio-economic field investigations as a result of this project. (see Section 14.1).

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**PART II**  
**PROJECT ANALYSES**

## 6.0 THE RUHENGARI ENVIRONMENT

### 6.1 General Setting

The Ruhengeri Prefecture is situated in the north-central highlands (1500-4500m) of Rwanda. It is one of ten administrative subdivisions within the country and covers an area of 1687 km<sup>2</sup>, or 6.6% of the national territory. The prefecture itself is divided into 16 communes (Figure 6A).

Ecologically, the Ruhengeri region is almost a self-contained watershed system. From a horseshoe-shaped rim of mountain ridges to the north, east and west, numerous watercourses empty into the central Mukungwa River basin. More than 90% of the Prefecture is drained by this network, which then flows south into Rwanda's principal river system, the Nyabarongo-Akagera.

Within the relatively limited area, a high diversity of biogeographical sub-divisions is found. In addition to the multiple afro-montane zones of the Virunga forest, four major agro-ecological regions have been identified within the prefectural boundaries. The latter are characterized by massive modifications of the landscape by a large, rapidly growing, and primarily rural population. Numerous environmental problems stem from the efforts of this population to further exploit and develop the existing natural resource base of the region.

### 6.2 Climate

The Ruhengeri region is characterized by a generally cool, humid climate. Average annual temperatures vary from 18°C in the lower Mukungwa valley to below 15°C at the base of the Virunga volcanoes (2700m). Snow is common at the highest summit of the volcanoes, Mt. Karisimbi (4507m).

Average rainfall increases from a low of 1100mm annually in the east, to 1200-1600mm in the central zone, and up to 2100mm within the Virunga forest. Rainfall is distributed bimodally, with a short wet season from September-December followed by the principle rains (40-50% of total) between February and May. The major dry season lasts for 60 days (July-August) in the mountainous north and up to 95 days (June-September) in the drier zone east of Lakes Bulera and Ruhondo. Moderate temperatures and reduced insolation are believed to maintain evapotranspiration well below precipitation levels, and prolonged drought is not considered a significant threat to the area.

### 6.3 Mukungwa Watershed

The abundant rains of northern Rwanda nourish an 890 km network of waterways in the Ruhengeri Prefecture. In addition, permanent lakes cover 7897 ha or nearly 5% of the region. Approximately 90% of the prefecture comprises the Mukungwa watershed (Figure 6B). The Mukungwa drains all but the southeast corner of Ruhengeri. It is fed by numerous sources, of which three may be identified as primary.

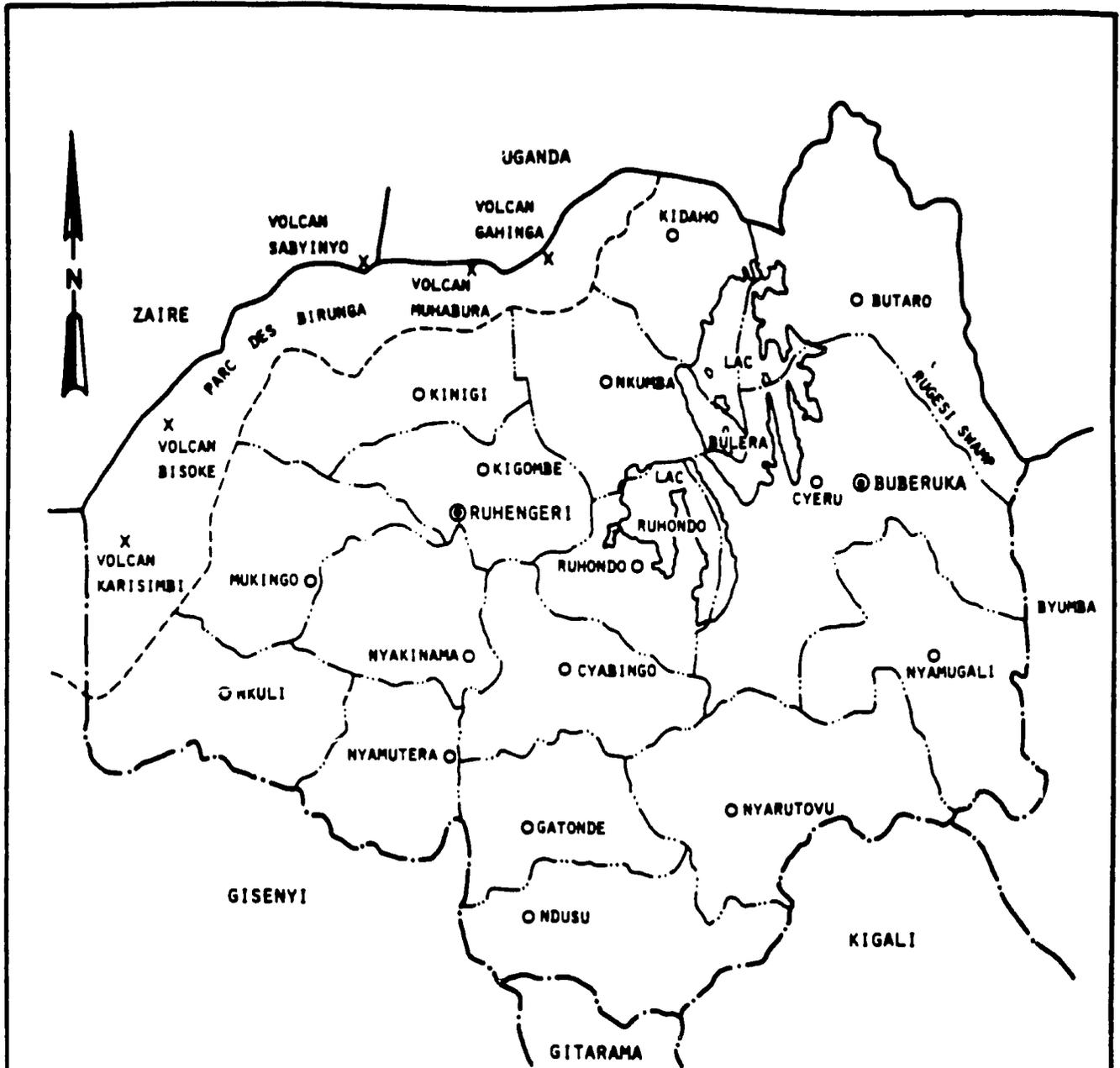


FIGURE 6A  
RUHENGARI PREFECTURE

- INTERNATIONAL BOUNDARY
- · - · - DEPARTMENT BOUNDARY
- COMMUNE BOUNDARY
- - - - NATIONAL PARK BOUNDARY
- ⊙ DEPARTMENT CAPITAL
- ⊙ SUB-DEPARTMENT CAPITAL
- COMMUNE

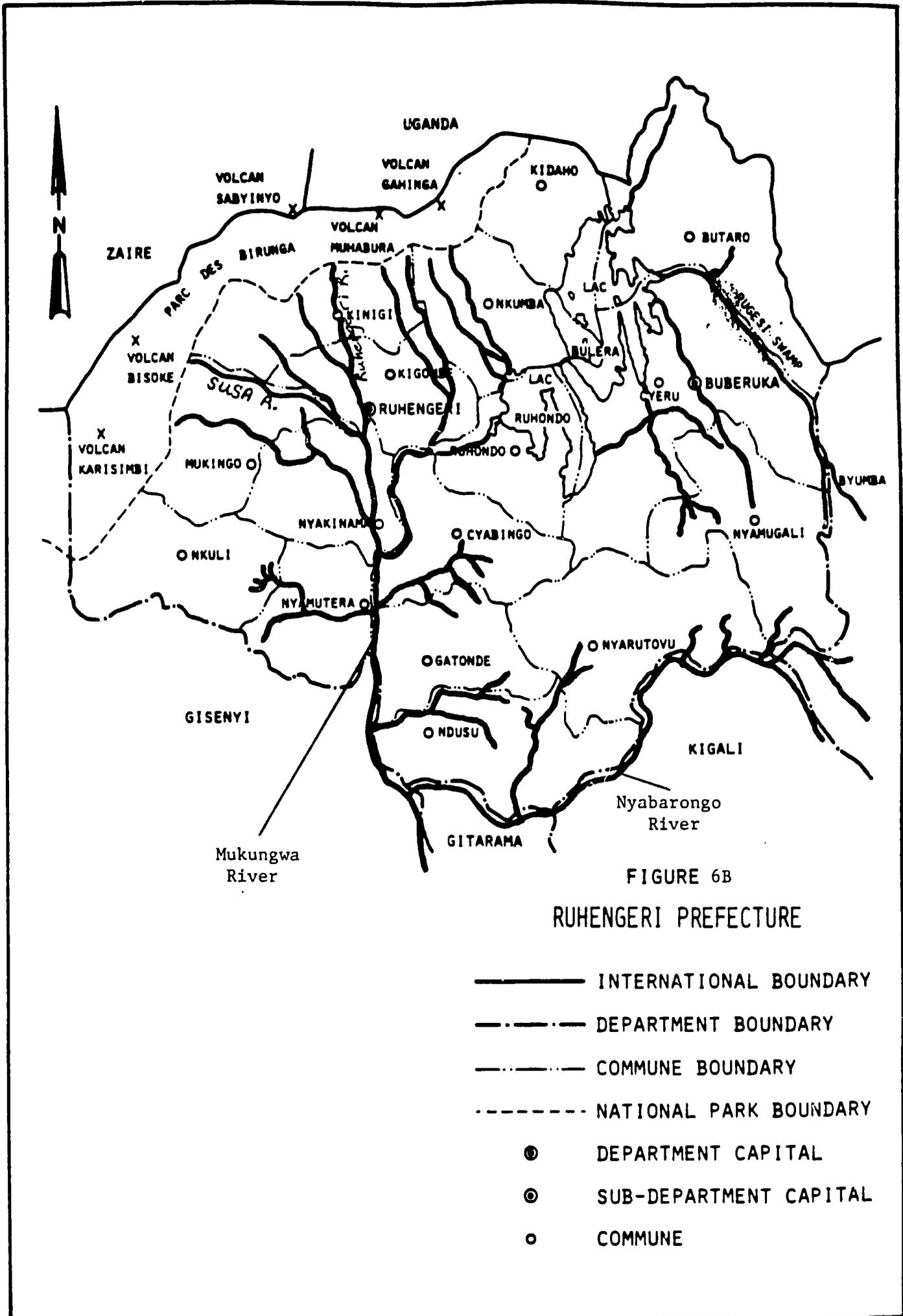


FIGURE 6B

RUHENGARI PREFECTURE

- INTERNATIONAL BOUNDARY
- - - - - DEPARTMENT BOUNDARY
- · - · - COMMUNE BOUNDARY
- · · · · NATIONAL PARK BOUNDARY
- ⊙ DEPARTMENT CAPITAL
- ⊙ SUB-DEPARTMENT CAPITAL
- COMMUNE

The longest, most regular and most abundant source of the Mukungwa begins in the high altitude wetlands of eastern Ruhengeri. The Rugezi River drains a 4535 ha Cyperus latifolius-peat bog complex between the communes of Cyeru and Butaro before emptying into Bulera-Ruhondo lakes complex. Formed during the Pleistocene, when the Virunga chain rose up and dammed all north-flowing rivers, Bulera (52 km<sup>2</sup>) and Ruhondo (26 km<sup>2</sup>) are Rwanda's first and third largest interior lakes. At its outlet in the commune of the same name, Ruhondo's waters first pass through an electrical generating station before joining the Mukungwa.

The other principal sources of the Mukungwa are less regular than the Rugezi-Ruhondo system, but nevertheless contribute significantly to its flow, particularly during the rainy seasons. The first of these is the Ruvumu-Rwebeye network of streams which drains the eastern sectors of the Virungas between Mts. Sabinyo and Muhavura. Originating in the montane rain forest, these streams receive year-around runoff from their humid surroundings, but much of the water filters down into volcanic substrate before reaching the densely populated lava plain. This water then resurfaces and flows into the Mukungwa in southern Kigombe commune.

The third major source of the Mukungwa is the Susa River and its tributaries which drain the Virungas from Mt. Karisimbi to Sabinyo. These watercourses are also prone to disappear underground during periods of low rainfall, but again resurface before joining the Mukungwa at the junction of the communes of Nyakinama, Nyamutera and Cyabingo. (One additional source originates outside the Ruhengeri Prefecture. The Giciye River flows from the Gishwati Forest to the west and empties into the Mukungwa just north of its juncture with the Nyabarongo. Parts of southeastern Ruhengeri, meanwhile, are not drained by the Mukungwa but rather make up part of the Base-Nyabarongo watershed.)

The Mukungwa hydrological network represents a primary resource to the residents of Ruhengeri Prefecture. In addition to providing critical surface water supplies to the population, the seasonal fluctuations in flow create ideal conditions for agriculture on plentiful, fertile valley bottomlands. Fishing is also a moderately important economic activity in the lakes and larger rivers. Beneficial effects extend beyond the prefectoral level as well, as the Nyabarongo carries water from the region across the entire country and eventually into the Victoria Nile system.

Localized problems of water supply remain, however. Despite its abundant rainfall, the Ruhengeri network of watercourses is the least extensive in the entire country. Even more serious, the entire northern lava zone is subject to chronic surface water shortages due to subterranean seepage. Finally, water quality and related health issues represent generalized regional concerns.

#### 6.4 Ecological Zones

The Ruhengeri Prefecture may be subdivided into five principal ecological zones. One of these may be described as a naturally occurring biogeographical unit; the other four are best understood with primary reference to their human ecological attributes. The zones are represented in Figure 6C and described in general terms below.



The Virunga Afro-montane Zone (4A). The Virunga range is currently protected by a multinational conservation area covering approximately 400 km<sup>2</sup>. Administrative responsibility for the area is shared by Zaire, Uganda, and Rwanda. Rwanda's Parc National des Volcans (PNV) comprises the entire southern slope of the range and now totals no more than 15,000 ha (SOMIRWA 1982). Roughly 87% of the park lies in the prefecture of Ruhengeri.

The PNV environment is characterized by cool temperatures and moderately high rainfall (1800-2100mm/year), which decreases slightly from west to east. Its rugged topography of eroded volcanic peaks rises from 2500m at the park's lower limit to more than 4500m on Mt. Karisimbi. While activity continues in the Zairian sector of the range, the Rwandan volcanoes are essentially dormant; the most recent lava flow occurred on Muhavura in the 1950s.

The overall Virunga ecosystem is a representative subset of the East African montane biogeographical region (Spinage 1972, White 1981, Hedberg 1951). Characteristic vegetation zones are differentiated primarily by altitude in addition to localized variations due to exposure, aspect, slope, and microclimate. The principal zones are: (1) that which is dominated by bamboo (Arundinaria alpina), between 2500-3000m, and (2) the Hagenia abyssinica-Hypericum revolutum forest zone between 2700-3200m. Above that altitude, subalpine communities of Senecio johnstonii and Lobelia lanuriensis predominate, giving way to an afro-alpine zone of limited plant growth above 3800-4000m.

The two lower zones are not only richest in abundance and diversity of plants, but also in animal species. The natural fauna of the Virungas includes over 100 avian species as well as forest dwelling leopards, hyena, antelope, buffalo and elephants. Four types of primates are also present, including the golden monkey (Cercopithecus mitis kanddti) and mountain gorilla (Gorilla gorilla beringei). While this afro-montane fauna is less diverse than that found in lowland tropical forests, there are rare, endangered and regionally endemic species.

The values of the PNV reserve are multiple. First, biogeographers see the Virunga ecosystem as a natural laboratory in which to study issues of extinction, colonization, and evolution on an isolated 'terrestrial island'. Montane wildlife, particularly the rarer species such as the mountain gorilla, has been studied by an international group of scientists working from the Karisoke Research Center over the past 15 years.

Second, the PNV is also important as a reservoir of genetic diversity, the value of which has been highlighted in numerous recent scientific publications. Virtually no research has been done in this area, yet to study local uses of forest products (food, medicine) the entire flora has unquestionable value.

Third, steadily increasing tourism in the Virunga region is a source of foreign exchange. Visitation rates and resultant income for the PNV have increased since the inception of a tourism development program in 1979. Park entry fees, however, are only a small portion of total tourism income. PNV visits now generate millions of dollars in gross tourism revenues and represent a major source of critically important foreign currency. At the local level, tourism has also increased employment opportunities but it is unlikely that a significant percentage of total tourist revenue remains in the region.

A final undeniable but less quantifiable value of the Virunga forest environment concerns its critically important role in water catchment. Heavy rainfall, protective vegetative cover, absorbant litter, porous soils and reduced evapotranspiration all combine to increase water retention and groundwater levels in the montane forest zone. Thus, although the PNV constitutes only 0.5% of Rwanda's total land area, it is said to represent more than 10% of the country's effective catchment area (Spinage 1972): a significant contribution to the well-being of the surrounding human population.

The Lava Zone (4). Rwanda is subdivided into 12 agroecological zones (Delepiere 1982, 1973). One of these is the extensive lava plain which completely surrounds the PNV and extends as far as 20 km to the south. In Ruhengeri Prefecture, this lava zone covers roughly 360 km<sup>2</sup>, or 21% of the total area. It includes the entire commune of Kinigi, virtually all of Mukingo, Nkumba and Kidaho, and major parts of Kigombe, Nyakinama and Nkuli (Figure 6C).

Mean altitude of the lava zone is 2200m. Annual rainfall averages 1500mm. The soils from which the region derives its name are extremely fertile, high-base status soils of volcanic origin (Andepts), mixed with more shallow lithosols on steep slopes and organic histosols in certain valley bottoms. In general, the relief is quite moderate. This combination of relatively favorable environmental factors has made the lava zone one of Rwanda's most productive agricultural areas.

The lava zone landscape lacks remnant natural vegetation and wildlife. Instead, one finds a patchwork mosaic of cultivated fields, dominated by corn and potatoes, mixed with peas, pyrethrum and some wheat at the highest altitudes. Below 1900m the more traditional Rwandan crop mix of beans, sorghum and bananas predominates. The land base of 360 km<sup>2</sup> also supports a livestock component which totals more than 30,000 Equivalent Animal Units (cattle, sheep and goats combined). Animal population densities are particularly high in the communes of Nkuli, Mukingo, and Kidaho.

In many ways, the lava zone is one of the most favored in all of Rwanda, which explains its extremely high human population density. Yet certain ecological factors have also combined to constrain development in this area. First, the high altitude limits the agricultural potential of the otherwise rich soil. While certain varieties of potato and corn are highly productive, other traditional staple crops give below average harvests. This limited agriculture base in northwestern Ruhengeri is a fragile subsistence operation.

A second major problem is the lack of water, because this region has no permanent watercourses. Prior to 1950, the lava zone around the PNV was occupied by few people due to a critical lack of surface water. During the 1960's an extensive network of water adductions was constructed which permitted greater occupation and exploitation of the land. It also resulted in the conversion of more than half of the PNV to agricultural land. Current human and livestock population levels, however, have now surpassed the capacity of the water delivery systems, and water is again in critically short supply.

Finally, land itself is a critical limiting factor. Almost all available land is in near-permanent agricultural production. This has caused a decline in grazing lands and has resulted in overstocking of remaining pasture. Land for

development of fuelwood plantations and communal woodlots is also in short supply. The large gap between wood supply and demand is bridged primarily by illegal exploitation of the Virunga forest.

The Buberuka Highlands (6). This is the largest zone in Ruhengeri and covers most of the eastern half of the prefecture. It includes the entire communes of Butaro, Cyeru and Ruhondo, almost all of Nyamugali, and parts of Nyarutovu, Ndusu and Kigombe (Figure 6C). The Rugezi wetlands and Lakes Bulera and Ruhondo are also located in this zone.

The Buberuka highlands have an average elevation of 2000m, showing a general downward slope from east to west. Mean annual rainfall is approximately 1200mm. Oxisols represent the dominant soil order in this region, interspersed with lithic entisols on quartzite ridges. Vertisols predominate in the Rugezi valley. Despite certain chemical deficiencies, the Buberuka soils are generally quite good for agriculture. They are also subject to extremely high erosion, however, if not properly managed.

Most Rwandan staple crops will grow in this zone, but yields from bananas, beans, sorghum, and sweet potatoes decrease with increases in altitude. Corn, peas, and potatoes produce well at higher elevations, where some wheat and barley are also grown.

The primary ecological constraints to development in Buberuka stem from land shortages in the face of high human population pressure. Delepierre (1982) includes this zone among those facing the most serious erosion threats in Rwanda. This is largely due to the fact that increasingly marginal, steeply sloped lands are being brought into cultivation without adequate anti-erosion measures. Agricultural practices have also seriously reduced land available for grazing and wood production. All of these issues are to be addressed by the AID Mixed Cropping and Agro-forestry projects proposed for the communes of Cyeru, Butaro, and Nyamugali. Important problems of water quantity and quality are also associated with development in and around the Rugezi wetlands and Lakes Bulera and Ruhondo.

The Central Plateau (7). This northern extension of one of Rwanda's largest agroecological zones covers all or most of the communes of Gatonde, Cyabinga and Ndusu, as well as parts of Nyarutovu, Nyamutera, and Nyakinama (Figure 6C). It includes the lower valley of the Mukungwa and is also partly drained by the Base-Nyabarongo system.

This is the lowest elevation zone in the prefecture, dropping below 1500m in the Mukungwa valley and never surpassing 1800m. Rainfall averages 1200mm annually. Soils are comparable to those of Buberuka, with oxisols of good agricultural potential predominating. Erosion risk remains high, but somewhat lessened due to more moderate relief.

Lacking any appreciable natural vegetation, banana plantations emerge as the principal plant cover in this elevation zone. Beans and sweet potatoes also do well, while corn and Irish potatoes decline in area. Coffee becomes important as a cash crop.

In addition to generalized problems of erosion and heightened competition for alternative uses of a limited land base (343 km<sup>2</sup> of potential agricultural land), much of the central plateau region is relatively isolated. The lack of an adequate road network reduces access to markets and thus forces the local population to orient production toward subsistence.

The Zaire-Nile Divide (5). The largest zone in Rwanda, the Zaire-Nile Divide forms only a small part of southwestern Ruhengeri Prefecture. No communes are entirely contained within this zone, but parts of Nyamutera, Nyakinama and Nkuli are included (Figure 6C).

Elevation rises steeply from 1900m to nearly 2500m in the extreme west, and an average rainfall of 1600mm drains entirely into the Mukungwa system. Soils evolved under recent forest cover (oxisols mixed with humus) have a neutral pH and fair agricultural potential. Bananas and beans give way to potatoes and peas at higher altitudes. Eucalyptus predominate on hillsides.

This region suffers from some of the more severe problems encountered in the Ruhengeri Prefecture. Despite significant tree plantations, erosion danger is extremely high in this steeply sloped zone. Livestock grazing accelerates this problem by breaking up the soil, yet the contribution of organic fertilizer from these animals represents a potentially important resource for cultivation. Dry season water shortages are an additional problem which places stress on the land's capability to support an extremely dense local population. Finally, residents of this zone also suffer from an inadequate communication network.

#### 6.5 The Human Resource Base

In 1978, Ruhengeri's population of 531,927 occupied a land base of 1687 km<sup>2</sup> at an average density of 315 per km<sup>2</sup> (Figure 6D and Table 6.1). This was one and one-half times the national figure of 189/km<sup>2</sup>, which already is the the highest national density ratio in Africa. Estimates for 1983 are 614,000 people in Ruhengeri; or about 520 persons/km<sup>2</sup> of cultivable land. Within the prefecture, population pressure on the land is greatest in the high altitude Lava and Zaire-Nile Divide zones and less severe in the Central Plateau and Buberuka.

Figure 6D traces the evolution of population densities in the 16 communes of Ruhengeri between 1948 and 1978 (source: Atlas du Rwanda). All but Butaro, Cyeru, Nyarutovu and Ndusu had surpassed 320/km<sup>2</sup> by 1978 and several were over 400/km<sup>2</sup>. This increase has been most notable in the Lava zone.

Population statistics indicate that Ruhengeri grew relatively slowly during most of the 1970s: 1.9% annum versus a 38% national average (Table 6.1). This figure, however, is almost entirely a function of emmigration and does not accurately reflect the region's natural reproduction rate. In fact, Ruhengeri has the highest fertility rate in the country, at 9.9 infants per female (MINIPLAN 1982). A study of migration into the southern Bugesera region in the 1970's (IAMSEA 1981) showed several tens of thousands of these immigrants were from Ruhengeri. It is of interest to note that Bugesera immigration dropped off rapidly as the region filled up by 1978; after which time the Ruhengeri population again began to increase more rapidly. The Ruhengeri population

Figure 6D

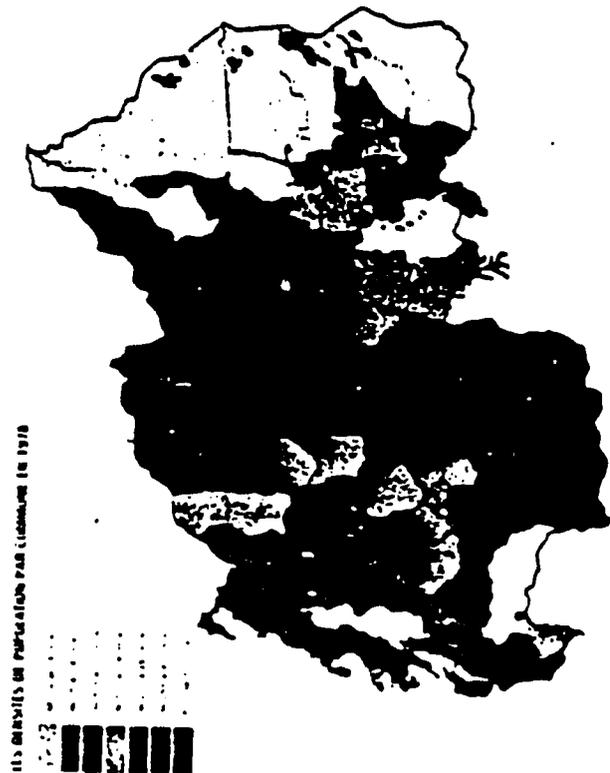
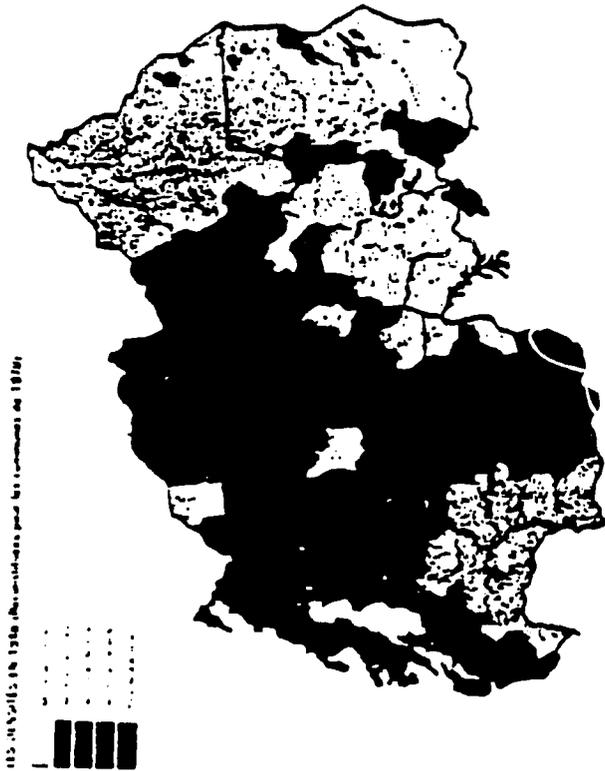
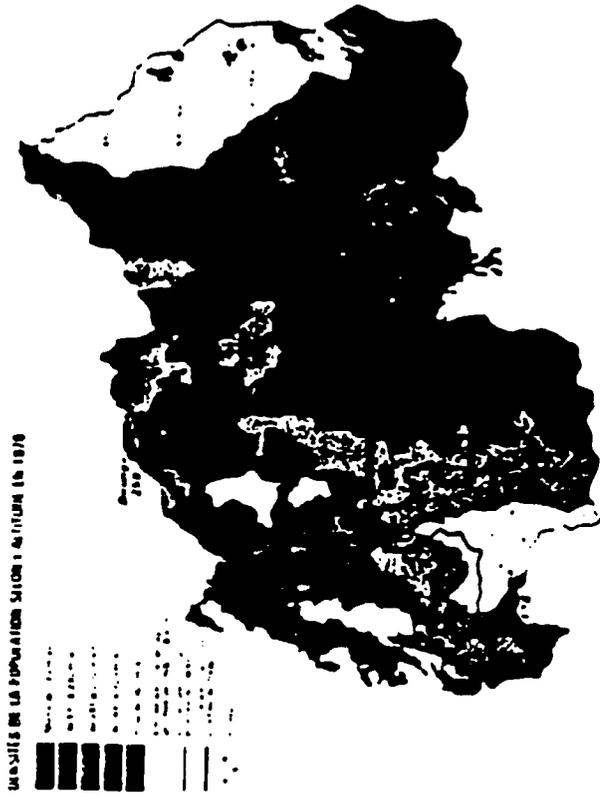
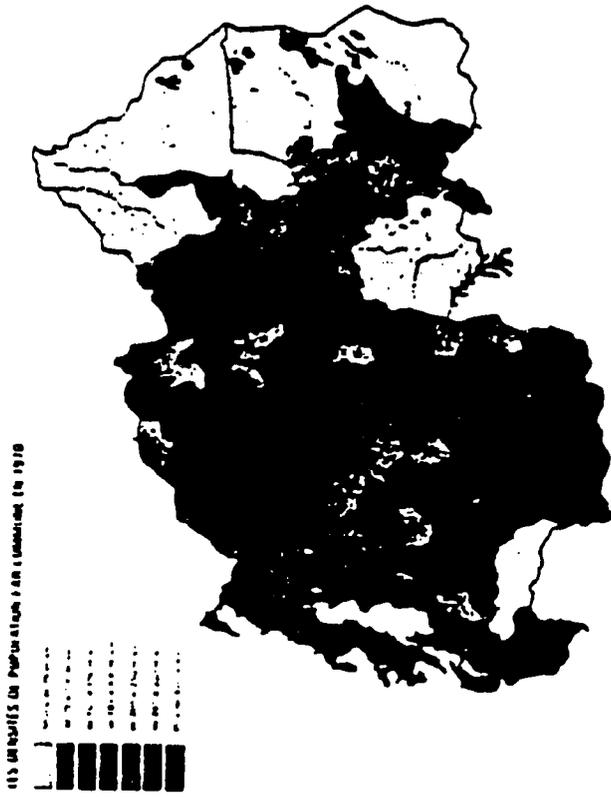


TABLE 6.1

## RWANDAN POPULATION STATISTICS

PREPECTURE	TOTAL AREA(km <sup>2</sup> )	ARABLE LAND(km <sup>2</sup> )	1978 POPULATION	DENSITY/km <sup>2</sup> TOTAL/ARABLE	1983 POPULATION	DENSITY/km <sup>2</sup> TOTAL/ARABLE	POP. GROWTH RATE 1970-78/1970-83
RUTARE	1873.2	1362.3	602,550	322 / 442	692,726	370 / 508	2.2% / 2.8%
BYUMBA	4820.0	1576.0	521,351	108 / 331	624,353	129 / 396	5.0 / 3.7
CYANOUQU	1735.6	792.2	333,187	192 / 421	415,501	239 / 525	2.6 / 4.5
OIKONGORO	2030.6	984.7	370,596	183 / 376	394,067	194 / 400	2.1 / 1.3
OISENYI	1640.0	1032.3	488,882	298 / 474	575,538	351 / 557	3.1 / 4.2
OITARAMA	2160.0	1539.4	606,212	281 / 394	698,351	323 / 454	3.4 / 2.9
KIBUNGO	4113.7	1286.5	361,249	88 / 281	476,631	116 / 370	5.5 / 5.7
KIBUYE	1338.7	777.7	336,508	251 / 433	384,548	287 / 494	5.2 / 2.7
KIGALI	3178.7	1973.3	698,442	220 / 354	925,436	291 / 469	8.2 / 5.8
RUHENOERI	1686.9	1181.0	531,927	315 / 450	613,950	364 / 520	1.9 / 2.9
RWANDA	25,595.0 57.5	12,505.4	4,830,984	189 / 306	5,801,102	227 / 464	3.8 / 3.7

growth rate is estimated at 2.9% for the period 1978-1983. The limited land resource base of Ruhengeri would then have to absorb and support a doubling of its already high population in less than twenty years. Furthermore, the fact that over 52% of those now living in Ruhengeri are under 18 years old indicates that this population could continue to grow well into the next century.

#### 6.6 Environmental Trends and Problems

The efforts of a large, rapidly growing population to satisfy its basic needs and pursue development has put considerable pressure on the limited land, water and renewable natural resource bases of the Ruhengeri Prefecture. Existing information permits a general analysis of resultant environmental trends in four critical problem areas.

Conservation of Natural Areas. The montane ecosystem within the Parc National des Volcans (PNV) is the only remaining significant natural area in the Ruhengeri Prefecture. It also represents a national and international resource of primary importance, as described above. Nevertheless, the Virunga environment has been diminished and degraded in a number of ways over the past 25 years.

Encroachment, or conversion of parkland to cropland, has occurred on a major scale in the PNV. In 1958, 7000 ha were taken from the central and eastern sectors for agricultural purposes. In 1969, an additional 10,000 ha were cleared from the central and western sectors for settlement and cultivation. Each of these large-scale conversions were carried out as a planned development project: the first for general agricultural development under the Belgian Colonial administration; the second, a pyrethrum production scheme financed by the European Development Fund.

The two major clearings plus some minor encroachments over the past 11 years have resulted in the loss of more than half of the PNV's original area (Figure 6E). Much of the area converted was under bamboo cover, but this lower montane forest zone also contained a greater diversity of tree and plant species than that which now remains. The impact on wildlife of this forest destruction was undoubtedly significant. Furthermore, recent studies have suggested that regional water supplies have declined as a direct result of this deforestation (SOMIRWA 1982).

Less noticeable forms of encroachment, such as the cutting of wood and bamboo, tend to degrade the forest environment over time. Similarly, illegal hunting decreases faunal abundance and, in the case of rare species like the mountain gorilla and leopard, has endangered their continued existence in the Virungas.

Some positive trends have helped offset the problems described above. First, an international conservation project has cooperated with the GOR since 1979 to improve park security, promote tourism, and develop public conservation education programs. This project has reduced poaching, generated tourism revenues sufficient to offset current alternative development proposals, and spread awareness of wildlife and forest preservation values. Second, the GOR has recently signed an agreement establishing the PNV as part of the International Biosphere Reserve system. This not only represents a public commitment to conservation, but could also help the GOR to obtain assistance, through the UN Man and Biosphere Program, for further park preservation efforts.

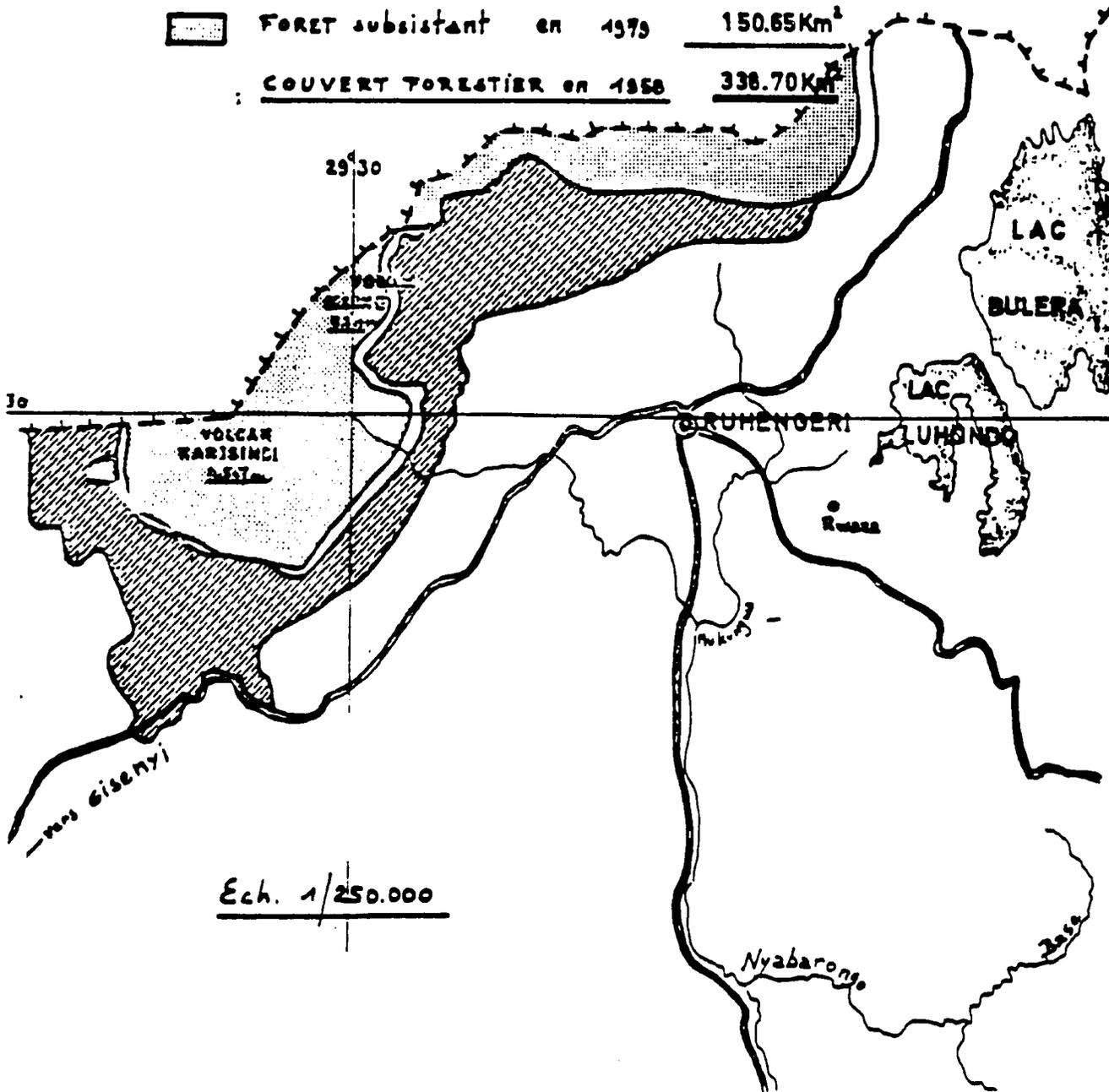
Figure 6E

# Carte de la REGION DES VOLCANS

## Evolution du Couvert végétal 1958-1973-1979

ETABLIE pour la Cie GEOMINES par l'A.I.D.R. RWANDA.

-  FORET détruite entre 1958 et 1973 174.70Km<sup>2</sup>
-  FORET détruite entre 1973 et 1979 13.35Km<sup>2</sup>
-  FORET subsistant en 1979 150.65Km<sup>2</sup>
- COUVERT FORESTIER en 1958 338.70Km<sup>2</sup>**



Soil Degradation. The magnitude of this problem was officially recognized by the declaration of 1983 as the Year of the Soil in Rwanda. Soil erosion and loss of fertility are generalized concerns across Rwanda, including the Ruhengeri Prefecture. Although good quantitative data are lacking for all areas, the Zaire-Nile Divide (ZND) and Buberuka regions of Ruhengeri appear to face the most serious soil loss and degradation problems. The ZND zone in particular has soils of only average fertility and suffers considerable mechanical erosion due to its combination of rugged relief and high rainfall. In the Buberuka region initial soil fertility is higher and rainfall lower than in the ZND, but soil structure and steep slopes create a high risk of erosion.

In the southern Mukungwa valley, erosion risk is considered to be slightly less than in the preceding zones, yet still quite high. This problem could be further exacerbated by the extension of coffee cultivation: an erosive crop if not properly managed. Similar problems are associated with increased cultivation of corn in the higher elevation zones: an important consideration given current plans to increase corn production in northern Ruhengeri.

Only in the Lava zone is mechanical erosion considered to be of negligible importance. While the thinner lithic soils on steep slopes still require appropriate management, soil structure and the generally moderate relief combine to reduce erosion risk. Attention should still be given to soil fertility due to the intensive, multiple season cropping practiced in the region; yet in this area as well, the volcanic soils are less threatened than those in other areas.

Between 1974 and 1980, the Rwandan people constructed or rehabilitated 16,000 km of terraces and hedgerows, effectively protecting 288,550 ha or 23% of all agricultural land. Although figures for the Ruhengeri Prefecture are lacking, it is certain that a positive counter-trend of prevention measures is in progress to combat the problem of erosion. In addition, government programs have encouraged farmers to more effectively combine and integrate their livestock with agricultural production to maintain soil fertility. All efforts to deal with soil degradation, however, will be put to severe tests in coming years as agricultural production must increase greatly to keep pace with population increases.

Fuelwood Plantation Deficit. At the national level, Rwanda is in a serious deficit situation with respect to fuelwood supply and demand. Wood accounts for 80% of all energy used and total domestic consumption surpasses three million tons per annum. At the same time, annual sustainable yields from existing plantations and private woodlots total only 1.10 million tons - a shortfall of 63%. If sustained cropping of national forests and parks is included in calculations, consumption still exceeds demand by almost 50%. It is therefore clear that the existing capital of planted and natural forest stocks is being steadily depleted to satisfy demand (Openshaw 1983, World Bank 1982).

Although detailed information for the Ruhengeri Prefecture and its subzones are not yet available from the recently completed national forestry survey, preliminary indications are that the regional supply-demand situation is equally bad, if not worse, than at the national level. The extremely high human population densities in the region result in heightened competition between agricultural and forestry interests for the same limited land base. The problem is particularly keen in the Lava zone where virtually all available land has excellent cultivation potential, whereas more steeply sloped terrain in other zones lends itself more directly to forestry uses.

Throughout the prefecture, communal land is lacking for fuelwood plantations, so small-scale woodlots and mixed agro-forestry projects are now being encouraged by the government. Hundreds of thousands of trees have been planted by individuals and communal work groups over the past several years, and an AID agro-forestry project is currently being planned for the communes of Cyeru, Butaro, and Nyamugali. In the long-run, these massive planting programs may actually satisfy demand; in the interim period of 10-15 years, however, critical fuelwood shortages will continue to exist and contribute pressure to exploit the remnant natural forests. Inadequate tree cover also allows erosion and numerous problems concerning water resources.

Water Supply and Quality Issues. Problems related to the quality, control, and quantity of water supplies are also of primary importance in the Ruhengeri region. In the northern Lava zone, water supply itself is a critical limiting factor. The lack of year-round rivers and lakes makes its population extremely dependent on an old, poorly maintained water delivery system. The current population greatly exceeds the capacities of this system to provide regular, adequate supplies of potable water. The problem seems particularly acute in the commune of Kidaho. While less generalized, local water supply shortages also occur on a seasonal basis in parts of the other three zones.

Water control and management is a major issue in the Buberuka region with regard to the Rugezi wetlands. Several major development projects have been proposed for that area, and appreciable modifications of the marshlands have already been carried out by a local population practicing raised-field agriculture. No studies have been conducted to determine the ecological impact of wetland conversions on the Rugezi system itself, nor on Lakes Bulera and Ruhondo. Experience from elsewhere would indicate that major modifications of the Rugezi wetlands would cause a greater seasonal variability of water levels in the marshland and resultant flows into the downstream lake and river system. Agriculture in the Rugezi valley and hydroelectric production at the outlet of Lake Ruhondo could be adversely affected by such changes.

Water quality, as well as quantity, has also suffered from increased population growth and associated economic development activities. Lakes Bulera and Ruhondo have recently experienced an invasion of schistosomiasis, a debilitating tropical disease transmitted by a snail vector to humans in water environments. Schistosomes are rarely found as high as 1900m, but outside workers from infected lowland areas apparently introduced them through their feces while working on the Ntaruka dam. Malaria has also increased dramatically in recent years, though causal factors remain uncertain. Waterborne diseases such as bacillic dysentery have broken out in several parts of the prefecture, especially during periods of surface water shortages.

Finally, point-source pollution of Lake Bulera and certain tributary waterways caused by upstream mining operations could pose serious environmental health risks. Although no studies of the highly visible mine tailing runoff sites have yet been conducted, it is known that an important by-product of wolfram mining is arsenic. The distribution and diffusion of this highly toxic chemical in the rivers and lakes should be monitored. Its potential for uptake by plants and eventual concentration in wildlife and human consumers should be carefully studied.

The nature and causes of the environmental problems presented above are appropriate subjects for further investigation, as are the linkages between them. More detailed analysis of these issues should lead to identification of priority actions to strengthen on-going efforts to mitigate or resolve them. The Ruhengeri CRDP includes several inputs intended to achieve this goal.

## 7.0 SOCIO-ECONOMIC PROFILE OF THE RUHENGERI POPULATION

### 7.1 Introduction

The population of Ruhengeri prefecture is estimated at nearly 614,000 in 1983, with about 520 persons per square kilometer of cultivable land. This ratio surpasses all but two of the ten prefectures of Rwanda. Population growth rate (1978-83) is estimated to be about 2.9% per year, up from a very low 1.9% in the early to middle 1970's. While population growth rate in Ruhengeri is well below the national average, there is some evidence that this has been due to emigration, which appears to have slowed markedly in recent years.

The people of rural Ruhengeri are overwhelmingly Hutu by origin. They are known generally as the Kiga (mountainmen). There are few significant cultural differences between the Kiga and other Hutu of Rwanda. As elsewhere in the country, descent groups are patrilineal, that is one belongs by birth to a lineage (umulyaugo) and clan (ubwoko) reckoned through the male line. Marriage is exogamous, that is a woman must marry a man from outside her lineage and clan. This causes some mobility, although the population is dense enough and mixed enough by descent groups so that most women marry close to home.

### 7.2 Rural Economic Organization

The bulk of the population of Ruhengeri prefecture are peasant farmers, owning an average of about 1 hectare of cultivable land and a few head of livestock, including cattle, sheep, goats, and pigs. Only about one household in three possesses an adult cow. Landholding is unequal among farmers, about two-thirds having less than the average, while a few possess up to five times the average holding (IBRD, 1977).

There are three forms of land tenure in rural Ruhengeri: traditional land tenure based on customary rights; non-traditional land requiring registration (rare), and State lands. Customary land cannot now be sold without prior permission from the Minagri, which can only approve the sale when the seller has at least two hectares remaining and the buyer possesses no more than two hectares. It appears that all types of transactions do occur, however, under certain circumstances and with the approval of the communal authority (burgomaster). The extent to which land sale is fragmenting existing estates and altering the distribution of holdings by rural families needs to be determined by the socio-economic survey of the CRDP.

A clear trend toward fragmentation of cultivable landholding is evident in traditional inheritance practices. Although women are disinherited by custom, some inherit, in principle, equal shares of their father's estate. A trend toward the giving of a larger share to the eldest son may be gaining ground in Ruhengeri, according to reports. The CRDP socioeconomic survey will determine to what degree the Ruhengeri population is spontaneously altering its inheritance practices, in order to avoid unviably small landholdings due to rampant population increase.

The unit of agricultural production is the family (urogo). Nationally, average family size is five and one-third persons, about equally divided between males and females. The family is nuclear or polygamous, never extended, since on marriage sons leave their parents' household and find their own. A wife joins her husband on his land. Polygamy, once rather common in Ruhengeri, is

discouraged by the central government and is decreasing rapidly. The socioeconomic survey will reveal the proportion of such households, since the division of household labor will be affected by the number of wives present. The population of Ruhengeri is known to have retained the highest propensity in Rwanda to polygamy. This and other small cultural differences with the population of the central plateau may mean that the Ruhengeri population has a unique set of adaptations designed to preserve their mountainous environment. These will be investigated in the socioeconomic survey.

Division of labor on the family farm is not strongly demarcated. Both men and women work in the fields in the same activities. However, men more often clear the land and engage in off-farm endeavors. Women do more of the planting and are dispensed from communal work service (umuganda). Harvesting is the work of both sexes. Herding is done by boys or young men. The labor force per average family (ages 15-64) is about two and two-thirds persons nationally, and one task of the socioeconomic survey will be to examine what change may be occurring in Ruhengeri in family size, number of economically active members, and division of labor. To what degree off-farm income is important and from what sources needs to be elucidated. Migration of family members, particularly young males, needs to be examined for its demographic and economic consequences.

Collection of fire wood and potable water is the work of women and girls and places them in direct contact with two of Ruhengeri's principal environmental problems: deforestation and water availability and pollution. This is why care will be taken in the socioeconomic survey to interview women as well as men. The perception women have of deforestation and water pollution is more important to know in many cases than that of their husbands who may be little concerned with those problems.

Decision-making in the household is normally the privilege of the male head of family, although the wife enjoys considerable influence over her husband's choices. In addition, it appears that nationally women constitute about 20% of household heads. The CRDP socioeconomic survey will investigate family decision-making and the proportion of female-headed households in Ruhengeri, now and in the recent past.

The family head plans uses of natural resources, primarily cultivable land, and directs household or hired labor to production activities. Considerable flexibility in household labor allocation exists, although some crops are generally worked by men, such as bananas and coffee, and some by women, such as basic food and vegetable production. Who does what, why and how needs to be examined in the socioeconomic survey. To what degree different types of soils are worked by different sexes or age groups needs to be elucidated.

In addition to family labor, household heads normally resort to the formation of larger work groups, particularly in field clearing, planting, and harvesting. Groups of neighboring families will work in turn without pay on each other's fields. This is called "umuganda", or reciprocal collective labor. A system of mutual lending of labor (gutereza) is also employed. A task of the socioeconomic survey will be to determine to what degree a family head draws on lineage (umulyango) mates for economic purposes, including joint exploitation of natural resources, which in the past were owned collectively by the patrilineage (all families related through the male line back to an ancestor 3 to 4 generations earlier).

Increasingly, wage labor is employed in agricultural activities. The daily wage rate in rural Ruhengeri (1982) was about 60 francs (66¢). Liberal amounts of banana beer are also provided. The socioeconomic survey will explore the uses of wage labor in resource exploitation, in order to calculate trends in on-farm and off-farm employment. It may be that a process of consolidation of landholdings is occurring with income for many households coming from a variety of wage earning family members rather than from the household's fields. Such a trend would be valuable to know for GOR policy modification in Ruhengeri or for the purpose of identifying a target group for environmental education or demonstration projects. Such a trend would also be another example of an adaptive strategy by the Ruhengeri population in the face of increasingly fragmented landholding due to population increase.

The major crops in Ruhengeri are in order of importance: bananas, potatoes, beans, sweet potatoes, sorghum, manioc, maize, and peas. A significant part of agricultural surplus exchange, perhaps up to half by value, occurs in the immediate neighborhood of the households. Most bananas, for example, are converted to beer and sold in the local area.

Rural Ruhengeri contains a network of small- to medium-sized markets which occur one to three times weekly, according to their size. Most take place biweekly, and the several markets located in a rural region occur on alternate days. Merchants, pedlars, and tailors circulate between them. Merchants, particularly, play the role of transporters of goods. They purchase and gather produce from the farmers in local markets and assemble and package goods for transport and sale in more distant areas.

There is no question that rural markets are developing rapidly in Ruhengeri, as in the rest of Rwanda. Around each market a group of buildings for mercantile activity has begun to constitute a core of increasing urbanization of the local population. This is leading to problems of water supply and water pollution, particularly on market days when hundreds of people flock to these centers for trade and socializing. As more permanent structures are built and as the fixed population in these centers increases, environmental problems will increase. The CRDP socioeconomic survey will examine the trend toward increased urbanization in Ruhengeri towns and in rural markets as well as the intensification of human rural settlement as family dwellings multiply in the countryside.

### 7.3 Conclusion

The portrait of rural socioeconomic organization sketched above is deceptive, for the quality of life is slipping rapidly in Ruhengeri, as in most of rural Rwanda. While some infrastructural improvements have been made, such as new roads, schools, and communal cooperatives, the basic problem of a population growth rate of 3.7% per year is rapidly producing irreversible environmental damage, as the Ruhengeri population struggles to feed itself. Because damage to soil, water, and forests, including the national park refuge of the mountain gorilla, is as yet in its early stages, it is important to act as soon as possible to establish a methodology of analysis and intervention to foresee and thus to forestall the worst of what appears to be inevitable environmental destruction. It is only through detailed knowledge of the society, culture, and economy of the people, and particularly their perception of current ecological trends, that remedial action can be effective.

## 8.0 BACKGROUND INFORMATION - EDUCATION SYSTEM

### 8.1 Formal Education

Currently about 50% of Rwanda's primary school age children and 4% of secondary school age children attend school. Until recently, the curriculum has been largely academic and based on European educational models. However, in an effort to tailor education to the rural lifestyle needs of the majority of Rwandan citizens, the GOR has instituted an educational reform program (Reforme Scolaire) which will:

- extend universal primary school education from a six year program to eight years.
- channel 90% of primary school graduates to post-primary vocational/technical training centers called CERAI's (Centre D'Enseignement Rural des Artisans Integres).
- select 10-15% of primary school graduates for a new "vocalionalized" secondary education; a minority of these student will be selected for a university preparatory program.

Curricula and materials for primary schools and CERAI's are developed in the Bureau Pedagogique d'Enseignement Primaire et Post Primaire. The present primary school curriculum provides instruction in environmental issues on a very limited basis through the course, Environmental Studies ("Etudes de Milieu"). This course was originally designed to focus on the human, institutional, and biological environment. However, lack of funds and technical expertise for curriculum and materials design resulted in a course which focuses more on institutions than on the environment. Currently, "Etudes de Milieu" provides information on general social studies in grades one to three. Some biology and other general sciences are added in grades four to six. The curriculum for the seventh and eighth years of primary education instituted under the Reforme Scolaire is in the design stage at present.

The Centres d'Enseignement Rural et Artisans Integres or CERAI's will eventually be the principal training vehicle for Rwanda's primary school graduates. Although general knowledge courses (e.g., French, Kinyarwanda) and some vocational subjects such as agriculture will be standardized and offered in CERAI's, each CERAI will specialize in a technical area such as plumbing, cooking, electricity, or dressmaking. Separate CERAI's will be constructed for men and women. As a long term goal, the GOR hopes to build 1290 CERAI's, one in every sector of every commune. (Approximately 120 are presently operating or are under construction). CERAI's will also offer adult education programs with short courses for specific vocational or technical subjects. As part of its Agricultural Education Project Agreement with Rwanda, USAID is providing funds for the construction of 30 CERAI's and technical assistance for CERAI curriculum development.

Secondary school curriculum and materials are developed by the Bureau Pedagogique d'Enseignement Secondaire. The present secondary education curriculum includes an environment-related program which has operated successfully since 1980 and which can be used as a base for future environmental education

efforts. This program, NATENRWA (Nature and Environmental Programs for Rwanda) is presently housed within the Natural Sciences Section of the Bureau Pédagogique d'Enseignement Secondaire. NATENRWA has developed curriculum, supporting classroom and teaching materials, and audio-visual aids (films, slide shows, etc.) which have been distributed nationwide. NATENRWA staff have also organized student nature clubs ("Amis de la Nature") and extra-scholastic film showings in rural areas, especially in areas near the national park in Ruhengeri.

Although NATENRWA has to date focused on national parks and conservation issues, its charter calls for a broad environmental focus, which NATENRWA has been unable to implement because of lack of funds and technical skills. In recognition of the need for more extensive treatment of environmental issues in the curriculum, a proposal is now under consideration within the Ministry of Education to move environmental curriculum development from its present home in Natural Sciences and establish a separate environmental curriculum section.

A consortium of international conservation groups has supported NATENRWA's technical assistance/parks curriculum and program development efforts until now. However, it appears that this consortium does not have sufficient funds to do so much longer; nor does it have the staff capability to provide technical assistance in broader environmental areas.

Training for agricultural officers and extension agents (A-2 and A-3 levels) is provided in part through specialized secondary institutions at Nyagahanga (for women) and Kibuye (for men). Under the Reforme Scolaire, agricultural training will continue to be provided by these schools, although additional training facilities are under consideration.

## 8.2 Non-formal Education

Rwanda is in the process of establishing a network of non-formal education centers around the country. These Centres Communaux de Developpement et Formation Permanente (CCDFP) will provide short courses and instruction to men and women and young adult men and women. Because more than half of Rwanda's population has had little or no formal education, CCDFP's will be a useful vehicle for providing brief technical instruction to adults. Although still in the conceptual stage, their eventual establishment nationwide offers an opportunity to reach people outside the formal educational system.

The Ministry of Social Affairs, Development and Cooperatives (MINSODEC) will play a key role in non-formal education. It is responsible for developing the CCDFP structure and program; it has also been given the responsibility for improving coordination among extension workers in the field (agriculture, community development, etc.); and it has been designated as the coordinating ministry for environmental affairs. Much of the coordination will be implemented through the CCDFP's from which extension workers can offer joint programs. The Ministry of Social Affairs, then, will in time be a central source of information on the many issues involved in environmental conservation, resource management and environmental sanitation through the CCDFP's.

## 9.0 INSTITUTIONAL ANALYSIS - PROPOSAL FOR THE ESTABLISHMENT OF A MECHANISM TO COORDINATE ENVIRONMENTAL AFFAIRS WITHIN THE GOVERNMENT OF RWANDA

### 9.1 Introduction

A major output of this project will be the existence of an environmental affairs coordinating body in the government of Rwanda. Although the concept of approaching development problems from an ecological or environmental perspective is relatively new to Rwanda, the Government of Rwanda in both the pre- and post-independence periods has been addressing problems related to natural resource conservation through its regular agriculture development programs. Problems of soil erosion and deforestation related to the hilly nature of Rwanda as well as to an exponential population increase have for decades preoccupied both the colonial and present leaders of Rwanda. Despite these efforts, the continued rapid population growth coupled with a broadening development strategy that includes agriculture intensification, agro-industry, construction of infrastructure, exploitation of mineral resources, etc., calls for a more coordinated governmental approach to minimize the degradation of the natural resources. The GOR, as the primary mover of Rwanda's development, has been evolving toward a more coordinated management of its development program, and with each step in this direction, environmental issues have become more explicit. It is essential to this project that an appropriate coordinating mechanism drawing together the action of several ministries, i.e. Natural Resources, Agriculture, Education, Interior, etc., be established prior to the full implementation of this project.

### 9.2 Current Structure

Although the CRDP focuses on the Ruhengeri Prefecture, it must take into account the whole central government administrative structure which extends down through the prefecture to the level of the commune.

For over a decade the GOR has been trying to decentralize its administrative functions to the level of the commune through a highly centralized structure. Essentially contradictory in nature, such a decentralization has merely resulted in prefectural and communal level governing bodies composed of various services (e.g., agriculture, health, natural resources, etc.) that respond to the directives of their respective ministries in the capital, Kigali. A social worker on the commune level is still directly dependent on his respective ministry for his operating budget, salary, and policy directives. Therefore, despite the efforts to decentralize decision-making to the field, the government of Rwanda remains a centralized structure. Properly coordinated policy directives would thus take place in the capital, even though they concern the prefecture of Ruhengeri.

Until December 1982, environmental affairs were handled by the Director of Geology in the Ministry of Natural Resources. His main function was to keep the GOR informed on environmental activities carried out by outside agencies such as UNEP. He was also a contact point for environmental information flowing into the Government from both private and official donor agencies.

#### 1. Ministry of Social Affairs and Cooperative Development

Since December 1982, coordination in the GOR for environmental affairs has

been vested in the Ministry of Social Affairs and Cooperative Development (MSACD) in the Office of Family and the Environment. This designation may indicate that the GOR currently views environmental problems as an integral part of its rural development program. The Ministry of Social Affairs theoretically is a rural development administrative structure which reaches down to the commune level where environmental issues can be treated. Since 1978 it has attempted to organize Communal Development and Permanent Training Centers (CCDFP) which are theoretically responsible for reassembling and integrating all rural development services of the various government ministries, including Centres d'Animation Rurale et Artisanale (since 1945), Centres Sociaux de Developpement (CSL), Centres Nutritionnels, Ministry of Agriculture extension work, Umuganda or the population free day of work to Rwanda, etc. The objective of the CCDFP is to mobilize the farmer to double agricultural production in "a few years" in order to keep up with population growth. Included in the agricultural mobilization campaign are the anti-erosion, soil fertilization, and reforestation campaigns. These constitute the concrete environmental activities undertaken by the GOR titled "la survie du Patrimoine" (survival of the Fatherland).

Standing between the Ministry for Social Affairs and the CCDFP is another integrated training center, the Prefectural Development and Permanent Training Center (CPDFP). The objective of the CPDFP is to train the personnel for the CCDFP's.

In the Ruhengeri Prefecture there are no fully functioning communal training centers nor has a Prefecture Training Center been established. If the CRDP wants to use these structures it must first undertake a construction and training program to set up CCDFP's. This is both impractical as well as costly. The absence of a workable rural development administrative structure in Ruhengeri seems to negate the rationale for using the Ministry of Social Affairs as the environmental coordinating body on the prefectural and communal levels.

On the central Government level, the Ministry of Social Affairs as a coordinating mechanism may have one advantage over other ministries in that it has no real "axe to grind" and is relatively non-threatening. However, this advantage may be outweighed by the fact that the Ministry of Social Affairs 1) has neither the administrative nor management capability to carry out the coordination, 2) has never really dealt with environmental issues before (erosion and representative campaigns were led by the MINAGRI), 3) is not privy to other projects which may have environmental impacts and are being financed by other ministries and donors, 4) cannot be the spokesman for environmental concerns because it has no counterbalancing expertise and 5) has not yet established the rural development structure needed to carry out its normal program much less absorb a new one.

## 2. Coordination Under Aménagement du Territoire

Parallel to the GOR's desire to coordinate environmental issues has been a growing sense that more coordination is required among the ministries to execute the Five Year Plan. So far, the Ministry of Plan has effectively coordinated the elaboration of the Plan but there is no effective coordination of the Plan's implementation. In March 1983, a GOR meeting of ministries recommended the creation of a cabinet level office (Secretariat d'Etat) or a separate Ministry of Development (Aménagement du Territoire) that would re-group urban services (Public Works), Habitat (Social Affairs) and Environment (Social Affairs). This recommendation repeated the need for coordination expressed in the Third Five Year Plan.

Before such a coordinating body or Ministry becomes a reality, the recommendation is expected to wind its way through the Government to the Conseil du Gouvernement, then the Service de Legislation where a presidential decree will be adopted, then to the Conseil National de Developpement, and finally to the President. The whole process could take a year.

If an office of environmental affairs within a Secretariat d'Etat or new Ministry handles environmental issues, it would have an advantage over a separate environmental coordinating body in that it would be involved in a wider range of development activities being financed under the Plan and thus not only promote environmental projects but also speak out on the impact on straight infrastructure or economic development projects.

Despite these encouraging signs in the government for more coordination and focus on environmental issues, there is still a gap in the government's understanding of integrated resource management. If the establishment of any coordinating body of environmental affairs does not reflect this understanding, there is a high risk that such a body may remain impotent for lack of properly designated personnel as well as vision.

### 9.3 Functions of a Proposed Environmental Affairs Coordinating Body

The purpose of this project is to promote an integrated management approach to natural resources use in the GOR by inserting overall environmental concerns into the decision-making process affecting development. The several Ministries comprising the GOR theoretically approach development in conformity to the overall development plan, however, the implementation of the plan is not coordinated. It is the assertion of this project that the fragility of Rwanda's resource base in the face of the population growth requires that the delicate balance between economic development and minimizing environmental degradation be maintained. It is thus essential that environmental concerns be inserted into both the planning and implementation of development activities.

In order to accomplish this task, some sort of coordinating body of environmental affairs will be needed. Some possible attributions of this body would be to:

1. serve as an "environmental focal point" responsible for seeing that environmental and natural resource considerations are given proper weight in the government's planning, programming, and budgeting functions.
2. be able to advise other ministries of environmental impacts of their proposed projects.
3. be able to interpret current legislation or even propose legislation in environmental and natural resource management.
4. be the repository of detailed data about the productivity and vulnerability of renewable resources, about the impact of alternative uses, about optional rates of exploitation, about tolerable pollution levels, and the socio-economic impact of resource management.
5. promote and find financing for training of all levels of manpower in a variety of professional and technical disciplines such as environmental sciences and engineering, planning, economics, law, and administration.

6. promote continued interest in environmental education to generate a higher level of public support through public school curricula and mass media programming.
7. draw up an annual "state of the environment" report to the government and the public.
8. promote studies to measure the environmental impact of various development projects (current and past), to avoid repetition of the same mistakes.
9. coordination of land use decisions.

#### 9.4 Suggested Types of Coordinating Bodies

Such a coordinating body should be organizationally flexible so that it can adjust to the varied and countervailing needs of the eight ministries involved. Forms that this body might take are described briefly below:

##### 1. Environmental Coordination Committee:

This committee would be organized by the existing Environmental Office in the Ministry of Social Affairs which in turn would serve as a secretariat and repository of environmental data. Each ministry assigns permanent members to the committee. The committee would have a regular schedule of meetings with concrete agenda prepared by Social Affairs. In order to coordinate each activity of the ETMA project, the committee would appoint, by written agreement, a lead technical ministry to backstop the activity and report back to the committee. For example, the Ministry of Natural Resources might be the lead technical ministry assigned to the physical inventories studies while the Ministry of Social Affairs organizes coordination committee meetings to assure the other ministries are informed about the inventories study. In another case, the Ministry of Social Affairs might serve as both the lead technical ministry for the socio-economic survey as well as the coordinating committee organizer. In other words the lead technical responsibility shifts from ministry to ministry depending on the technical competence required while the Ministry of Social Affairs remains the permanent focal point of coordination through the committee. This mechanism is structured, yet not overbearing. It allows for the technical gaps which exist currently in the Environmental Office of the Ministry of Social Affairs.

This coordinating committee, stimulated by the varied activities of the CRDP, would hopefully evolve into a viable permanent mechanism that would review environmental issues related to projects being financed through other donors.

During the period of CRDP implementation, the project office in Kigali would work directly with the Ministry of Social Affairs to organize these committee meetings as well as the lead ministries to carry out specific technical activities.

##### 2. A High Level Environmental Affairs Office:

Another alternative mechanism can be the establishment of a more centrally controlled body within the government. This could take the form of a presidentially mandated Office of Environmental Affairs located on the level of the Presidency. This office would possess the political clout necessary to

coordinate and probably would be staffed by both management and technical cadres who would receive training from this project. It is conceivable that this office may serve as a central coordinating mechanism itself or merely backstop an environmental coordination committee like the one mentioned above. This centralized approach falls into line with existing tendencies in Rwandan government. Its chief advantage is bureaucratic clout. However, it may also lose this clout as political attention spans tend to be short. It also represents another bureaucratic creation which might be a bit overbearing for some existing ministries.

### 3. Creation of a New Ministry

A recent interministerial conference on the infrastructure development of the country recommended the creation of a new development ministry that would put various services from other ministries under a new roof to implement the Development Plan. Services like environmental affairs, urban planning, cartography, etc. would function to coordinate most of the development projects being financed by the donors or the Rwandan government.

Although creating another rather heavy structure in a government that is already overly centralized, the advantage of this solution would be an environmental affairs office that is involved in the midst of the actual implementation of the country's development plan, thus privy to all that is being financed. There is also the possibility that the creation of another ministry to coordinate broader issues of development might drown out the voice of environmental matters. Also, whether newly created ministries can coordinate well entrenched ministries is another questionable factor.

### 9.5 Process to Formulate a Coordinating Body

The ultimate decision as to the nature of a coordinating body must be made by the Government of Rwanda itself. This project can only facilitate this decision, providing a forum to discuss the options as well as concrete activities to stimulate committee action.

STAGE I. Pre-project training to draw up a proposal for the establishment of an Environmental Affairs Coordinating Body. Spring 1984.

AID and SECID will finance with ETMA project seminar funds a three to four day seminar of integrated resource management for all the ministries involved in the implementation of this project. Participants will 1) review the CRDP project document and make any suggestions for change, 2) discuss concepts of integrated resource management, and finally 3) draw up a detailed proposal for an environmental coordinating body with attributions set forth above.

STAGE II. Follow-up on the coordinating body proposal and preparatory staff training.

1. The government of Rwanda will carry the above proposal through the approval system required for eventual presidential approval, using the technical and material support provided by this project as incentive.

2. During the period of approval, the project will work with the existing environmental office in Social Affairs and fund the resource inventory and research that will eventually set up the data base for the new coordinating body. Training specifically geared to the manpower needed to staff this body will begin in both the technical and management fields. Training will probably be short-term, in the USA, and not exceed one year.

STAGE III. Establishment and functioning of the coordinating body.  
Summer, 1984.

The establishment of this body will probably be achieved about 12 months after the start of this project. Returning trainees of stage II will be slotted to the new body.

The CRDP technical assistance running the project management office will be transferred to this new body and serve as advisor to its director.

## 10.0 ANALYSIS OF AGRICULTURAL ISSUES

### 10.1 Overview (Taken directly from the AID FY 85 Rwanda CDSS)

The Rwandan economy depends heavily on the agricultural sector, which provides 47% of GDP, 90% of employment, and 60% to 70% of export earnings, primarily from coffee and tea. After agriculture, manufacturing and commerce constitute the most important components of GDP, with 16 and 15% respectively.

A population of about 5.2 million in 1982 gives Rwanda the highest population density in Africa (with 189 persons per square kilometer) and the third highest in the world, after Bangladesh and Sri Lanka. This population is expected to reach 10 million by the year 2000 and will attain 23.5 million by 2020 if the present growth rate of 3.7% and the fertility rate of 8.8 children per woman are not reduced. Thus, population growth represents Rwanda's overriding development concern.

Over 95% of Rwanda's population is spread throughout the hilly countryside, cultivating an average of less than one hectare per family. Annual rural income per capita is about \$150, of which about one fourth is monetized income derived from coffee, tea, pyrethrum, cinchona or food crops.

Despite its high population density, Rwanda has traditionally been able to feed itself. Food production has increased steadily since 1960 and in 1980 stood at nearly 40% above the 1969-71 average, or 7% higher per capita. Thus, food imports have remained at less than 10% of total imports and consist of food which is not produced in Rwanda. Staple food crops include bananas, sweet potatoes, manioc, potatoes, beans, sorghum, maize, peas, and peanuts in descending order of production in 1980.

### 10.2 Presentation of the Issues

Population growth is an important issue in Rwanda and central to an examination of agricultural issues. It is predicted that Rwanda's food production will not be able to match the population increases in the near future. The reduction in available food per individual can be temporarily offset by food imports but this will become an economic burden over time. With agricultural research, capital investment, and the implementation of modern farming technologies the agricultural sector can increase the yield per hectare of both traditional and non-traditional food crops. Within several years this increase in production could match the growth in population. Short-term answers have been to bring more land under cultivation at the expense of forests and to continue growing crops of low nutritional value. Since 90% of Rwanda's employment is in the agricultural sector, this continued expansion has eased the economic questions of unemployment facing this growing population.

The patrilineal land tenure system is leading to the fragmentation of available cultivable land into increasingly smaller plots. This is decreasing the amount of time any piece of land will lay fallow. The result is decreased productivity and an increased potential for soil erosion. Soil erosion is now a critical problem in Rwanda. The demand for new lands for food crop cultivation

is coupled with demands for new land for the production of tea, pyrethrum, and other export crops. These crops are grown on the hillsides at high altitudes and contribute to soil erosion problems in Rwanda. Both forms of cultivation, food and cash crops, are contributing to soil erosion and the piecemeal destruction of Rwanda's remaining forests. The GOR has initiated a nation-wide survey of unused cultivable lands to identify areas that are under-utilized. This effort is aimed at easing the problems of food production and deforestation.

Traditional agriculture in the Ruhengeri tends to favor the middle altitude slopes. There is regular and adequate rainfall and the temperatures are suited to the traditional crops. At the higher altitudes the amount of rainfall increases and the temperatures decrease. These factors affect the crop selection and these areas have not been farmed in the past. More recently, cash crops (tea and pyrethrum) have provided the incentive to cultivate the high altitude lands. Much of the remaining forests are at these higher altitudes and are now being destroyed. Also, the lower temperatures at higher elevations promote greater fuelwood consumption. Farming in the lower wetlands has been limited in the past. The presence of insects carrying diseases, excessive soil moisture, and higher temperatures unsuitable for traditional crops have all contributed to the limited utilization of this land. It is felt that the introduction of new crops and non-traditional farming methods will increase the utilization of this land for crop production.

Many of the traditional food crops cultivated are low in nutritional value. The Ruhengeri diet is low in proteins, fats and oils. Their ease of cultivation and reliability explain their continued cultivation. Approximately 60% of the land under cultivation in Rwanda is tied up in beans, bananas, and sorghum. Several of the food crops have the additional attraction of having cash value in the local markets. This monetary value accounts in part for their wide-spread cultivation. Bananas, rice, and potatoes are good examples of these dual purpose crops.

The cultivation of cash or export crops can increase the average farmer's income but the necessity to produce food limits the amount of land available for cash crop farming. Roughly half of Rwanda's farmers grow some export crop. Coffee has been a traditional export crop and is widely distributed. In most cases it does not compete with food production in either space allotment or labor. The traditional farm's emphasis remains on food or dual purpose crops. Tea, pyrethrum, cotton, rice, and sugar have different altitude and moisture tolerances from many of the traditional crops and are grown on newly developed non-traditional lands. In general men cultivate the cash crops so the competition for labor to grow food versus cash crops is limited. Out of 900,000 ha under cultivation in Rwanda coffee is grown on 29000 ha, tea on 9000 ha, pyrethrum on 2000 ha, quinine on 3000 ha, rice on 1300 ha, and sugar cane on 640 ha. Because of their monetary importance, these crops receive a larger proportion of capital and technical input than the food crops. The expansion of export crop production threatens the forests and national parks in the Ruhengeri.

Both traditional and modern agriculture in the Ruhengeri compete with livestock production. The pasturage demands of livestock compete directly with the need of more land to produce food and export crops. This is unfortunate since livestock provide an additional source of protein to the diet. The numbers of livestock have decreased in recent years. The production of vegetable and animal products could be increased by supporting an integrated farm management system. The use of manures to increase soil fertility and unused plant parts for animal feed would increase the productive value of some lands.

### 10.3 GOR Emphasis

The Rwandan Third Five-Year Plan (1982-1986) of official policy devotes a significant amount of discussion to the current agricultural issues facing Rwanda. The Third Plan states that Rwanda intends to achieve food self-sufficiency and thus places a high priority on food production. Given the limited land available for cultivating, this policy suggests that increased production translates into increased yields per hectare. Food production is targeted to increase at an average of 3.2% per year but there is considerable variation among the targeted increases. Some of the food staples (beans, sorghum, and manioc) are expected to achieve only marginal increases. Livestock production is expected to grow at 3.1% per year and cash crops are anticipated to increase by an average of 4.3% per year. Some crop substitution is planned to improve the nutritional value of the food crops. Increases in fisheries production are also designed to improve the nutritional balance.

To achieve the anticipated increases in food production the GOR plans to take several steps to improve the quality of inputs into the agricultural sector. An intensification of applied agricultural research and the development of agro-industry should lead to improved seed stocks, pesticides, fertilizers, and farming methods. Soil conservation and rehabilitation measures are planned to protect the remaining soil resources and improve soil fertility. The Third Plan recognizes the need for improved tools and increased training and extension efforts to help farmers improve their yields. Finally, there is a need for increased agricultural credit, and an improved marketing and transport infrastructure with price incentives to stimulate the production of favored or necessary goods. Given the magnitude of these steps, progress and increased production will be slow in realization but is not out of reach.

### 10.4 The Role of the CRDP

The problems of land utilization, deforestation, soil erosion, nutritional deficiency, fuel depletion, and food production shortfalls are not a simple manifestation of overpopulation. The problems are complex and interrelated. They relate to issues of resource management and planning. The introduction and implementation of new technologies are only part of the solution. The CRDP is designed to address the questions of resource management.

The need for improved and intensified agricultural research will be assisted by the collection and storage of data by the CRDP teams. CRDP experts will address problems of soil erosion, deforestation, water resources management, and other issues related to the problems discussed in this section. It is anticipated that the Environmental Coordinating Body will be able to channel the efforts of numerous development and technical aid projects to avoid a duplication of efforts. This coordination should be able to identify the priority issues and recruit the technical or developmental assistance necessary if it is not already present.

*18w*

**PART III**  
**DETAILED DESCRIPTION OF CORE PROJECT ACTIVITIES**  
**AND**  
**SCOPES OF WORK**

## 11.0 ORIGINS OF THE CRDP, SECID DESIGN TEAM SCOPE OF WORK

### 11.1 Original Memorandum

TO: John Gaudet, REDSO  
FROM: Tom Gilbert, ETMA/SECID  
SUBJECT: A Cooperative Regional Demonstration Project in Rwanda

The attached materials have been prepared for Eugene Chiaveroli, so that he can propose to the Government of Rwanda the initiation of a "Cooperative Regional Demonstration Project" (CRDP) in the Ruhengeri Region of Rwanda. This project would help to integrate other proposed U.S. AID projects in the region and provide a thorough ecological resource assessment of the region. Briefly a CRDP is intended to be a planned approach to "pooling" and integrating experience, expertise, and financial resources to develop on-site demonstrations of improved resource management and environmental protection in a particular geographic region. It includes:

1. choice of a geographical area by the types of ecosystems, land-use practices, and sets of environmental problems that it contains;
2. analysis and characterization of the natural resource potentials and major environmental problems and descriptions of the constraints and opportunities;
3. development of a plan to use the best experience to demonstrate solutions to key environmental problems in specific sites, and to relate research, training, and education activities to these sites; and
4. development of model programs which can be adapted and used in other regions sharing similar characteristics and problems.

The attachments include:

1. general descriptions of a proposal for a CRDP in Rwanda;
2. the description of the proposal in a U.S.A.I.D. logframe; and
3. draft of a scope of work for the Ruhengeri planning team.

### 11.2 Original Proposal for a Cooperative Regional Demonstration Project in Rwanda

#### 1. Environmental Problems in Africa

The depletion of natural resources and deterioration of environment is occurring so rapidly in many African countries that essential life support systems and food production cannot be sustained for many

years if present trend continue. Governments may not be able to reverse this trend because of surging population pressures on the land. However, it is possible to demonstrate solutions to these complex, interrelated problems by the "pooling" of financial resources, experience, and technical assistance, in a planned integrated attack on the problems in specific geographical regions. Technical assistance projects carried out in isolation and without the active, motivated involvement of people most directly affected by the problems will not be sufficient.

If Rwanda, with its limited land resources, could demonstrate the necessary action to reverse these trends it would be a very useful model for this and other countries and provide significant national benefit. The following is an approach which could be taken.

## 2. Cooperative Regional Demonstration Projects

In November 1982, the Environmental Training and Management in Africa (ETMA) project, in deciding strategies for its work in Africa, approved a plan to initiate "Cooperative Regional Demonstration Projects" (CRDPs) in several countries. These projects would combine in a planned, integrated approach the resources and expertise of various technical assistance organizations to assist governments to improve resource management and environmental protection in specific geographical regions. The regions will be selected by the types of land systems they contain and their associated sets of land use practices and problems. The emphasis will be on site specific research, training and resource management, adapting techniques where possible, which have been proven in other areas.

## 3. Recommendation to Establish a CRDP in the Ruhengeri Prefecture

It should be recommended to the Government of Rwanda that a CRDP be planned for the Ruhengeri region. This is a particularly suitable region because:

- a. It can be identified by its land types and characteristic problems such as deforestation, soil degradation, and loss of crop production capacity. Similar situations are found elsewhere in Rwanda and other countries, so solutions to problems here could be applied in other areas.
- b. Although the region is densely populated and intensively farmed, it still contains some of the world's most unusual and spectacular natural resources. The Virunga Mountain Forest, for example, includes the mountain gorilla which is a unique resource found in no other region of the world. The mountain forest is also Rwanda's most important watershed, but the value of this is not sufficiently understood or appreciated by many in the area. The proposed CRDP would assist in developing training and education activities to interpret the many values of this resource to the region and to the country.

- c. The proposed AID project, Rwanda Cropping Systems Improvement, will focus on ways, especially in the Ruhengeri, the yield per hectare of food crops can be increased. A CRDP could complement this project by addressing other environmental problems such as water supply and quality, environmental health and pollution, soil erosion monitoring and training and demonstration in these areas. Studies of the role of women in the community, especially their role in agriculture could be initiated, and suitable training for women could be developed in cooperation with the Rwanda Cropping Systems Project and appropriate Rwandan institutions.
- d. The region's natural forest and the indigenous species it contains need to be more thoroughly assessed for existing and potential values and uses. I do not know how many species occur in Rwanda, but Tanzania has perhaps 10,000 species of vascular plants. I have listed 2,000 species from Mt. Kilimanjaro alone, and the Virunga forest also has a great variety of species though fewer in number. Conversion of the remaining approximately 2% of Rwanda's original forest could not contribute significantly to crop, timber and fuel-wood production, but it would do irreparable harm and eliminate options for the future. Rwanda now relies on fewer than 10 major food crops. If one of these is extensively damaged by pests, drought, or disease, then the country will face serious food shortages. Most of the tree species and the major food crops are historically recent introductions. These may not be the most suitable species over a long term, for there are environmental problems associated with some of them, for example: soil degradation in some Eucalyptus forests. Therefore, a careful assessment of the potential of indigenous species is needed. People for centuries have used a variety of species of plants and animals from the forest, so there are undoubtedly many uses today for these underexploited resources. A CRDP would undertake studies of this potential, along with appropriate training and educational activities associated with indigenous resources.

#### 4. Participating Organizations

Representatives of several organizations and technical assistance projects have indicated willingness to participate and support the development of CRDPs. These include representatives of:

- The UNESCO Man and the Biosphere Program (MAB)
- The U.S. National Academy of Sciences, Board on Science and Technology for International Development (BOSTID)
- The AID/National Park Service Project on Environment and Natural Resources
- The A.I.D./Forest Service Project on Forestry Management Services
- The A.I.D. Project on Women in Development conducted by the South-East Consortium for International Development (SECID)

- The Office of Program Development, US Peace Corps
- Several Conservation Organizations, including the African Wildlife Leadership Foundation (AWLF)

Many other organizations will probably participate once plans begin to develop. Examples include the AID Energy Initiatives in Africa project, the Regional Remote Sensing Facility, Nairobi, Kenya, the Food and Agricultural Organization (FAO), the World Bank, and several U.S. agencies. Representatives of the U.S. Department of the Interior have expressed interest in supporting this approach. Consultants to the Rwanda project would also be available through the centrally funded A.I.D. Project on Environment and Natural Resources which provides short and medium term consultants to AID Missions and host countries.

##### 5. Initiation of a Project

If a proposal for a regional project is presented to the Government of Rwanda, and is accepted ETMA would begin right away to take the following steps:

- a) An interdisciplinary team of experts would be formed to work with the Government of Rwanda and the local authorities it designates to develop a plan for implementing a CRDP. The ETMA Project would be responsible for recruiting this team in cooperation with U.S.A.I.D. Rwanda. ETMA and probably other organizations such as the UNESCO Man and Biosphere Program would assist in organizing support to carry out the project.
- b) Implementation of the project would include the following activities:
  1. assessment and characterization of the indigenous natural resources and their potential uses;
  2. assessment of critical environmental problems and natural resource management activities appropriate to the social and cultural traditions of people in the region and development of these activities with the GOR;
  3. development of on-site demonstrations to show both the nature of the problems and the means to solve them; and
  4. development of communication and education programs related to the local environment and specialized training of Rwandans to conduct model programs in the region.

11.3 Log Frame, ETMA/Rwanda Proposal

**NARRATIVE SUMMARY**

- Programme Goal:
1. To reverse the trend of degradation of natural resources and the environment and to restore and maintain the resources essential for life.
  2. To make the most effective sustained use of indigenous natural resources for the benefit of people now and in the future.

Project Purpose: In the Ruhengeri Prefecture, to develop a Cooperative Regional Demonstration Project (CRDP) which would pool experience and expertise to solve environmental problems and develop on-site demonstrations which could be transferred to other regions and countries facing similar problems.

Outputs: Establishment, in the Government of Rwanda, of the capability, in people and in institutions, to solve critical environmental and resource management problems, which will include the following:

- a. an improved assessment of natural resources, their values and uses, and the development of a natural resources data base for use in planning, management and development.
- b. trained Rwandan personnel in fields such as natural resources classification and assessment, resource management, soils, environmental health and pollution.
- c. development of an environmental education program and on-site demonstrations of improved resource management and environmental protection in the Ruhengeri region.

Inputs: USAID

Short-term consultants:

Project Planning Team

Short and medium term consultants: Resource assessment, planning, management, research, education, etc.

Long Term: Project Coordinator.

Participant Training: Short and long term.

Other Costs: Commodities, equipment, education programme, etc.

GOR: In-kind support.

Other Participating Organizations: Miscellaneous

## VERIFIABLE INDICATORS

Measures of Goal Achievements: Effective natural resources management and sustained use. Improved environmental health and living conditions for people.

Conditions that will indicate purpose has been achieved:

End of project status:

- A resource data base being used in planning, resource management.
- Trained Rwandan personnel in critically needed areas such as natural resource management, erosion and pollution control, etc.
- An informed and actively participating public in maintaining their environment.
- Uses of under utilized natural resources such as indigenous plant materials.

### Magnitude of Outputs

To be determined in the planning phase of the project.

### Implementation

Target:

To be determined in the planning phase of the project and modified as needed throughout the project.

## MEANS OF VERIFICATION

Periodic surveys of natural resource and environmental health conditions.

Conduct periodic evaluation with participating ministries and institutions. Field visits and evaluation of project sites and demonstrations. Long-term follow-up evaluations of training activities and results of the training.

## IMPORTANT ASSUMPTIONS

1. GOR will give high priority to the program to improve resource management, environmental protection.
2. Conservation and development are mutually compatible

GOR will designate appropriate ministries and institutions to participate in the project, make available resource personnel to participate in the planning and implementation of the project. GOR will provide qualified personnel for the specialized training.

Project records and periodic follow-up evaluation visits to sites and participating institutions.

GOR will participate in the development and implementation of a plan. GOR will develop appropriate policies, and procedures for management of resources and environmental protection.

Project Records.

Technical assistance from the U.S. and other sources will be made available once plans for the project have been developed. GOR will provide in-kind assistance.

#### 11.4 Scope of Work for Ruhengeri Planning Team

##### 1. Background

The Environmental Training and Management in Africa (ETMA) project is an AID-sponsored cooperative technical assistance project to work with African governments and institutions to expand the environmental information base and increase the capacity of African governments to deal with their major environmental problems. As part of the ETMA project activities in East Africa, a Cooperative Regional Demonstration Project (CRDP) is being considered for the Ruhengeri Prefecture. Prior to implementation of this activity, a planning team composed of technical experts from the United States will work with Government of Rwanda counterparts to develop an implementation plan for the CRDP.

##### 2. Purpose

The Project Planning Team will be formed to a) analyze environmental problems, trends, and resource management opportunities in the Ruhengeri Prefecture; b) identify areas for further research; and c) develop a plan for implementation of a program for technical assistance and training. These inputs will serve to assist the GOR to develop a capacity for integrated resource and land-use management for the Ruhengeri Prefecture which could eventually be used as a demonstration for addressing resource issues in other areas of the country.

##### 3. Project Planning Team

A multidisciplinary team working in close collaboration with GOR counterparts will develop an implementation plan for the proposed CRDP. The requirements for the Project Planning Team call for the following specialists:

- a. Natural systems ecologist;
- b. Sociologist/anthropologist;
- c. Resource/agricultural economist;
- d. Conservation specialist;
- e. Development administration specialist; and
- f. Water quality/environmental health specialist.

Given the collaborative mode of the proposed project, the GOR may identify appropriate counterparts to work with Project Planning Team staff while the team is in Rwanda.

#### 4. Scope of Work

The Project Planning Team will gather data on the current status of the resource base, land-use practices, resource pressures, GOR institutions and mechanisms and development activities through: a) review of relevant scientific literature available in the United States, Rwanda and elsewhere, b) discussions with staff from various GOR ministries and African regional development institutions, and c) field reconnaissance. In-country work will be done in the closest cooperation with GOR-designated counterparts.

Analysis of the natural resources and the environmental problems will include the following:

- a. the current status of the resource/environmental information base for Rwanda, particularly with respect to the Ruhengeri Prefecture;
- b. the current state of resource deterioration in the Ruhengeri Prefecture;
- c. the cause/effect relationship between resource deterioration and pressures on the resource base;
- d. the perception of the local people of the value of sustained use of the resource base and the socio-economic implications of continued deterioration of the resource base;
- e. the status of development assistance projects in Rwanda, particularly in the Ruhengeri Prefecture; and
- f. management and administrative issues facing the GOR in addressing resource management and environmental issues.

The members of the team will focus on specific but interrelated areas as follows:

- a. Natural systems ecologist
  - Environmental implications of land use practices and technical assistance needs.
  - Vegetation types and the species they contain. Traditional, current and potential uses, and wildlife diversity and value.
  - Introduced crop and tree species, weeds, and their impact on environment.

b. Sociologist (anthropologist)

- Cultural and social conditions and practices regarding natural resources and environment. Perception of needs by people.
- Impact of resource depletion on people in the area.
- Focus on role of women especially in agriculture and training needs.

c. Resource/agricultural economist

- Assessment of the general economic factors relevant to the project area from the perspective of its inhabitants, the national economy, and the overall ecological zone affected by the project area.
- Economic analyses of the various program initiatives considered by the team.

d. Conservation specialist

- Focus on the integration of conservation of the remaining indigenous natural resources and the development of the region; assess means to restore wildlife and vegetation and to lessen the impact of growing population pressures and development on the protected natural resources and means to make more effective uses of the protected resources.

e. Development and administration specialist

- Focus on Rwandan government institutions and mechanisms (legislation, policies, etc.) for dealing with key environmental problems and training. Comment on the management resources required by AID, particularly in connection with the other AID initiatives planned for the project effort.

f. Water quality/environmental health specialist

- Focus on assessment of water supplies and their quality and means of maintaining or improving the supply and quality.
- Assess the current state of pollution and sources of pollution means of sanitation and technical assistance needs in this area.

## 5. Results

Based on the above analyses, the Project Planning Team will make recommendations for a plan for the implementation of a Cooperative Regional Demonstration Project for integrated land-use and resource management in the Ruhengeri Prefecture. The recommendations will address:

- a. specific resource management problems of high priority in the Ruhengeri Prefecture;
- b. the level and type of technical assistance required;
- c. the level and type of environmental training required;
- d. a review of the management and organizational issues facing the GOR in the implementation of the project;
- e. the level of effort required and proper organization of project management by A.I.D.; and
- f. the possible contributions to the purposes of this project by YGO, international organizations, and other interested organizations.

### 11.5 CRDP Design Team

The design team was appointed to the project by SECID in February 1983. Team Members include:

1. Dr. Philip Boyle  
Anthropologist-Sociologist  
9208 Arabian Ave.  
Vienna, VA 22810
2. Ms. Virginia Caye  
Women in Development, Agriculture  
R.D. #1, Box 209A  
Julian, PA 16844
3. Mr. Doug Hudgins  
Water Quality and Public Health  
c/o Hazen & Sawyer  
308 Cotton Bldg.  
4505 Creedmore Rd.  
Raleigh, NC 27612
4. Dr. J. Frank McCormick - Team Leader  
Ecologist, Natural Resource Management  
Director and Professor, Graduate Program in Ecology  
University of Tennessee  
Knoxville, TN 37996

5. Dr. Michael P. Mau  
Development Administration, Project Design  
31 S. Stricker Street  
Baltimore, MD 21223
6. Mr. William Weber  
Institute for Environmental Studies  
70 Science Hall  
University of Wisconsin  
Madison, WI 53706

Consultants used include:

1. Dr. Charles Cushwa  
Senior Wildlife Biologist  
Eastern Energy Land Use Team  
Office of Biological Services  
U.S. Department of the Interior  
Washington, DC
2. Dr. Wilfred Joseph  
Agronomy Faculty  
Natural University of Rwanda  
Butare, Rwanda

## 12.0 PRE-PROJECT SEMINAR

### 12.1 Objectives of the Pre-project Seminar:

1. to review concepts of integrated resource management with GOR officials.
2. to review the CRDP project document.
3. to make concrete recommendations for a GOR coordinating body to oversee the implementation of this project.

### 12.1 Proposal agenda: March 1984

Day 1 Group flies/drives from Kigali to Gisenyi. Dinner at Meridien followed by appropriate French language film/slide presentation on relevant conservation subject.

#### Day 2 A.M. Topic: Integrated Resource Management

Welcome by Minister or Sec-General of Social Affairs.  
Keynote Presentation: "Integrated Resource Management" by distinguished scientist (perhaps representative of UNESCO MAB Program) on practical approaches to management of environmental problems using experiences from on-going projects in tropical areas.

Integrated resource management in Rwanda/Ruhengeri.  
Presentation of range of environmental problems in Rwanda, with specific attention to Ruhengeri, and generally perceived need for a more coordinated/integrated approach to their solution (talk with visual aids).

Lunch at Hotel

#### P.M. Topic: CRDP/ETMA Proposal

Opening remarks by Sec-General Social Affairs.  
Brief introduction by SECID representative.  
Presentation of proposal.  
Long-term goal and purposes of project  
Discussion of proposed project activities  
Solicitation of GOR inputs, particularly to priority subjects for inventory and resource management.

#### Day 3 Field Trip to Ruhengeri Prefecture

Trip should be carefully planned and prepared to provide fullest exposure to range of environmental/resource conservation problems of the region. (Soil erosion, water quality/supply, deforestation/reforestation imbalance.) Experienced expatriate and national experts should provide explanations and stimulate discussion by workshop participants. Picnic/lunch en route and return Meridien for dinner/discussion.

Day 4 A.M. Topic: CRDP/ETMA Proposal & Implementation

Complete discussion of proposal, with emphasis on management aspects, schedule for implementation and need for coordination.

Lunch

P.M. Topic: Role and Structure of an Environmental Coordinating Body

Existing GOR structure to deal with environmental issues. Presentation of alternative models/case studies with discussion of pros and cons of each - also consider relevance of alternatives to the Rwandan situation (chaired by outside expert or GOR representative from the Presidency).

Day 5 A.M. Topic: Recommendation for an Environmental Coordinating Body in Rwanda

Discussion and final recommendation on: activities, staffing needs, and interim and long-term structures of environmental coordinating body.

Lunch/adjourn/Return Kigali

### 13.0 TERMS OF REFERENCE FOR THE CRDP PROJECT FIELD DIRECTOR

#### 13.1 Qualifications of Project Field Director

1. Ph.D degree in resource management, ecology, or similar discipline or equivalent work experience.
2. Minimum 3 years experience in francophone Africa, preferably Rwanda.
3. French fluency equivalent to FSI rating 3+.
4. Demonstrated ability in field management of multi-disciplinary development assistance projects.

#### 13.2 Duration

Three years

#### 13.3 Field Relationships

The Project Field Director will be the focal point in-country, for technical and administrative management of the CRDP. The individual will act as the link between:

1. The technical assistance provided by the project and the Government of Rwanda with respect to the GOR's efforts to create an insitutional infrastructure for continuation of the activities and programs initiated by the CRDP;
2. The contractor management (SECID) and the Office of the AID Representative (OAR);
3. Field activities as defined in the CRDP project paper and contractor back-stopping;
4. The GOR and other international development assistance agencies and institutions, including the OAR; and
5. The CRDP and other development projects being implemented in the Ruhengeri Prefecture, either by AID or other donor agencies.

The Field Director will begin work in the United States two months prior to the pre-project seminar, participate in that seminar, and return to Rwanda within 4-6 weeks to initiate the project.

#### 13.4 Duties

Prior to the implementation of the pre-project seminar, the Field Director will work with the ETMA project management at SECID's office in Chapel Hill to:

1. Organize the core group of technical experts who will implement project activities in Rwanda and provide technical advice to SECID on implementation of project programs. Organization of the team includes identifying specific disciplines required, specifying scopes-of-work, and interviewing candidates for the technical short-term assignments;
2. Work with SECID's Procurement Department and the technical team to draw up specifications of equipment and materials to be procured for the project, identify best ways for shipping, and initiate waiver procedures as necessary;
3. Prepare a draft Working Agreement to be entered into between the Government of Rwanda and SECID and approved by AID/AFR/RA and the OAR for implementation of the CRDP. This Working Agreement will include:
  - a. an analytical framework which describes the purpose of the CRDP, the priority of the CRDP, the relevance of the CRDP to the ETMA project, linkage to other ETMA activities, and follow-up activities;
  - b. a general description of the CRDP including a logical framework;
  - c. a general Work Plan for the 30-month implementation period and a specific Work Plan for the first year's activities;
  - d. specification of the GOR and AID/ETMA responsibilities;
4. Prepare for the pre-project seminar, including:
  - a. assisting SECID in recruiting a consultant to participate in the workshop;
  - b. coordinating workshop presentations and discussing the roles and responsibilities of workshop leaders; and
  - c. preparing documents containing the texts of formal presentations, pertinent literature, and references that will constitute the workshop manual.

For the implementation of the pre-project seminar, the Field Director will:

1. Arrive in Rwanda approximately 3-4 weeks in advance of the scheduled seminar to:
  - a. work with the GOR in organizing the seminar; and
  - b. review with GOR officials the CRDP plan and draft Working Agreement.

2. During the seminar:
  - a. coordinate activities with the GOR seminar Director;
  - b. give presentations on environmental policy and management;
  - c. serve as a workshop leader, participating in discussions and answering questions; and
  - d. participate in the preparation of the workshop reports, the evaluation, and the final report.
3. Following the seminar:
  - a. revise the CRDP project paper; and
  - b. finalize the Working Agreement.

Upon arrival on post, approximately 4 weeks following the seminar and GOR approval of the Working Agreement, the duties of the Field Director fall into two broad categories: administration and technical management.

With respect to the administration of the CRDP, the Field Director will be responsible for:

1. Establishment of a field office.
  - a. locating office space;
  - b. purchasing of equipment for office;
  - c. establishment of banking relations;
  - d. identification and hiring personnel (secretary, driver); and
  - e. arranging communications, utilities and other support.
2. Day to day administration of the field office.
  - a. supervising local personnel (time sheets, tasks, etc.);
  - b. responding to SECID, AID, GOR inquiries;
  - c. managing financial records and controlling finances;
  - d. handling logistics, permits, and visas for project personnel; and
  - e. preparing financial and summary progress reports for ETMA office.
3. Counterpart training.
  - a. cover items step-by-step necessary to establish and run the office;
  - b. turn over to Rwandan counterpart those duties counterpart is ready to handle; then supervise as necessary; and
  - c. explain necessity of organized management to success of project.
4. Reporting
  - a. reports to ETMA/SECID covering management of project (financial/administrative); and
  - b. reports to GOR, OAR, and SECID covering progress to date.

With respect to functioning as the technical director in the field, the Field Director will be responsible for:

1. Management of inputs of technical assistance.
  - a. schedule expert's work/arrival to best mesh with in-country activities and logical progression of project;
  - b. keep ETMA/SECID informed of exact technical needs to aid identification of appropriate experts;
  - c. schedule Rwandan counterparts to work in close association with project personnel providing both parties with background information to maximize benefit of contact time;
  - d. ask the larger questions designed to modify the project direction to its best outcome;
  - e. keep GOR and ETMA/AID informed of technical needs, direction, and emphasis to establish technical dialogue; and
  - f. identify activities, agencies and funds suitable for CRDP attention.
2. Dissemination of CRDP purpose.
  - a. promote concepts of CRDP within Rwandan government to maximize cooperation and interest, including periodic presentations of project findings to GOR;
  - b. promote concepts of CRDP to other projects and agencies to enlist support and expertise;
  - c. assist in the establishment of a GOR coordinating mechanism; and
  - d. facilitate the expansion and extension of the CRDP to other sites with other funding.
3. Data management.
  - a. overall responsibility for data base management;
  - b. supervising Rwandan counterparts in data collection and data base management;
  - c. training Rwandans in use of data base, issue identification (methodology) and preparation of technical requests for assistance;
  - d. reporting of data and data analysis results to GOR and to ETMA/SECID; and
  - e. assist short-term experts in data collection, logistics, and training of counterparts for data collection.

### 13.5 Counterpart Relationship

Three counterpart GOR officials should be assigned to the CRDP field office.

The main counterpart to the CRDP Field Director is the appointed head of the Environmental Affairs Office, currently located in the Ministry of Social Affairs. General integrated resource management training in the U.S. is available to this counterpart. In addition to this training, the project field director should work closely with this principal counterpart in all phases of the project activities. This counterpart relationship is the key to the continued success of the CRDP. Since the project director is technically under the administrative responsibilities of the Environmental Affairs Office Director and therefore ultimately reports to him/her in the GOR, the counterpart training function must be handled in a professional and dignified manner. Certain agreed upon functions of the project director and the Environmental Affairs Office Director must be worked out in a manner that involves the EAO director's active involvement in the substantive part (as opposed to a purely administrative) of the CRDP.

The two other counterparts to the project director are the computer specialists who will understudy the CRDP's computer specialist and perform all computer functions after the expert's field tenure. The importance of these counterparts cannot be overstated since they hold the key to access and use of the computerized data base. It is expected that these counterparts would work full time in the CRDP project office in Kigali.

#### 14.0 TERMS OF REFERENCE FOR THE INFORMATION SYSTEM ON NATURAL RESOURCE STRESS POINTS

##### Sequence of Studies

The sequence of the studies is outlined under the description of Core Project Activities presented in Part I, Section 3.2. The studies will be in the following order:

1. Socio-economic inventory;
2. Public health survey; and
3. Physical and biological resource inventories.

The integrated data base that results from the aforementioned studies will be used to analyze historical trends in environmental quality, land use and degradation. Such an "information system" is operational and has proven successful in eight states in the United States.

This project is based upon the premise that there is a body of information regarding natural resources on each of the representative communes in Ruhengeri. To whatever degree this premise is unsubstantiated, field studies will be necessary to establish an information base.

Specific objectives are: 1) to review scattered and diverse information sources in Rwanda and Belgium in order to summarize resource information in a standard format with standard definitions; 2) to establish a focus for natural resource information within the Prefecture and for the nation; 3) to develop a process of updating resource information. Development of an integrated information system, based upon a systems science, requires conceptual, ecological, and practical field research.

Information needs include: 1) resource distribution, diversity of quality, and quantity; 2) resource distribution according to ecological zone and land use patterns; 3) relationships to other resources in each zone; 4) resource value and rate of change; 5) value of related resources and rate of change; and 6) management goals and objectives.

Potential benefits of an integrated information system to a coordinated (interministry) management agency or office include: 1) reduced total cost to each ministry; 2) coordinated centralized information; 3) consistence and data quality control; 4) synthesis of all available information; and 5) pooling of talent and expert opinions.

Several factors influence the design of an integrated information system. These includes: 1) complexities of management institutions, communes, prefecture, national government and donor activities; 2) biological and physical complexity of the resource, 3) availability, completeness and accuracy of information; and 4) time and cost of coordination.

Implementation of an integrated information system capable of providing information in a form suitable for trend analyses and projections involves the following tasks; 1) establish an office of coordination on which all activities take place; 2) assess information needs; 3) design a data base format; 4) from budget projections identify user fees and other sources of continued funding and

personnel; 5) identify sources of information and experts to evaluate the quality of information available; 6) select hardware and software systems to meet needs; 7) develop an editing procedure; 8) develop and implement data input procedure; 9) develop and implement data distribution and user training; and 10) develop and implement an update procedure. A major advantage of a computer assisted information system is that updating is feasible.

The cost of this activity is included in the basic management budget, including hardware, software and personnel. All other activities are dependent upon development of this information system.

#### 14.1 Socio-Economic Survey

##### 14.1.1 Human Resources: Socio-Economic Inventory and Field Study

###### A. Rationale: Effect of Population Growth on the Environment

The socio-economic study within the CRDP is designed to measure and evaluate the human causal dimension of the process of natural environmental degradation in Ruhengeri prefecture. It is also intended to examine the population's perception of the causes of various types of ecological damage and to measure the extent of popular participation in traditional or governmental conservation efforts.

The broad outlines of the process of environmental degradation are well known. An agrarian population is expanding at a rate of over 3% per year, placing enormous pressure on a fixed cultivable land base. This has led to intensification of agriculture, including reduction or elimination of fallowing, resulting in soil erosion and loss of soil fertility. The transfer of marginally productive areas from pasturage to crop land has long since reached a position of diminishing returns, leading to reduced crop yields, reduction in number of livestock, overgrazing, and erosion of topsoil.

With rapid population increase, great demands have been placed in Ruhengeri on remaining fuel and construction wood supplies, including the protected forest of the Volcanoes National Park. Inevitably, wood collection has greatly outpaced natural replacement, and increasingly rapid deforestation is occurring.

Throughout Ruhengeri there has been an increase in settlement density. This is particularly apparent around market centers and in Ruhengeri town. Intensified human habitation around natural water sources in rural areas is leading to pollution of supplies and water shortages. Unsanitary crowding from rapid urbanization in Ruhengeri town is bringing heightened risks of epidemic illness.

The primary task of the socio-economic study in the CRDP is thus to examine and to elucidate the causal interrelationships in the various economic and socio-cultural practices intrinsic to the process of ecological deterioration in Ruhengeri prefecture. Once these have been elucidated and trends have been determined, the GOR can intervene as necessary to effect desirable modifications in human use of natural resources. This is the major function of a long-term socio-economic monitoring unit within the Ministry of Social Affairs and Community Development (Minasodeco).

Socio-economic analysis in Ruhengeri will focus on four major topics: 1) population growth and composition; 2) patterns of environmental use; 3) perception of ecological problems and trends; 4) popular participation in conservation programs. Data will be collected on a number of variables, which, when updated every few years by Minasodeco, will establish clear trends. Historical data for the same variable, where available, will help to extend these trends into the past. These variables include the following:

1. Population growth and composition

- a. Population growth rate
- b. Birth and death rates
- c. Age/sex composition
- d. Family size and composition
- e. Migration patterns of family members
- f. Settlement patterns and densities

2. Patterns of environmental use

- a. Agricultural practices and techniques
- b. Herding practices and techniques
- c. Uses of wood and water and rates of consumption
- d. Land tenure system, property rights, inheritance rules and practice
- e. Division of labor in productive activities (family farm unit and cooperation between families)
- f. Economic contracts
- g. Marketing strategies
- h. Wage labor and point of origin of workers
- i. Use of soil
- j. Exploitation of wildlife and vegetation

3. Perception of ecological problems and trends

- a. Awareness of the types of environmental problems and their causes
- b. Awareness of water pollution and water-borne diseases and their causes
- c. Knowledge of possible solutions to problems and attitudes toward ecological deterioration (i.e., fatalistic, passive, activist, uncaring)

4. Popular participation in conservation programs

- a. Traditional individual or collective conservation practices and extent of participation
- b. Awareness of governmental conservation programs
- c. History of personal involvement in governmental conservation programs
- d. Awareness of and respect for the protected species of the Volcanoes National Park
- e. Exposure to appropriate technology and training
- f. Access to governmental education and training facilities, including mass media (radio)

B. Objectives of Socio-Economic Analysis

1. To supply the CRDP and the GOR with information on those demographic and socio-economic characteristics of the Ruhengeri population which directly affect the process of environmental degradation. Through trend analysis and correlation of socio-economic change with environmental change, the process by which population growth leads to specific ecological problems can be elucidated and measured. The CRDP project office and its successor in the Ministry of Social Affairs and Community Development shall use these data and their analysis to present policy options to the GOR Inter-ministerial Council for the Environment.

2. To assess the population's perception of current or potential environmental problems, trends, and possible solutions.

3. To assess the people's awareness of and recent participation in governmental programs addressing environmental problems, including the extent of popular involvement and the level of success in attaining objectives.

4. To aid in the selection of sites for physical and biological inventory and field investigation activities. These will provide the data necessary to document the degree and rate of environmental degradation.

5. To aid in the design of relevant formal, non-formal, and outreach education programs and in the planning of appropriate conservation projects to demonstrate solutions to priority environmental problems.

6. To provide baseline data for comparison with end-of-project objectives, in order to aid in final project evaluation. These objectives will include significant change in the population's awareness of environmental problems and in the extent of popular participation in conservation efforts.

C. Personnel Required

<u>Personnel</u>	<u>Qualifications</u>	<u>Time</u>
Anthropologist/ Sociologist	Ph.D., Social Anthropology (or Rural Sociology) with field experience for dissertation in French-speaking African country. Fluent French. Some knowledge of economics. Experience in statistical survey work.	30 weeks
Rwandan Sociologist (counterpart to anthropologist)	Graduate university degree in law, sociology, geography, public administration, etc. Preferably already located in Minasodeco.	30 weeks
Rwandan Research Assistants (2)	Undergraduate degree in law, sociology, geography, public administration, statistics, social welfare, etc. Preferably functionaires of Minasodeco or students at National University.	16 weeks

<u>Personnel</u>	<u>Qualifications</u>	<u>Time</u>
Rwandan Survey Enumerators	Undergraduate students at Ruhengeri campus of National University (law, geography, sociology, etc) or employees of Minasodeco.	12 weeks

D. Time Periods and Personnel

<u>Activity</u>	<u>Time</u>	<u>Personnel</u>
Inventory of existing data	4 weeks	Anthropologist, counterpart sociologist, research assistants (2)
Questionnaire survey:	(Total=16 weeks)	
1. Preliminary field investigation	2 weeks	Anthropologist, counterpart sociologist, research assistants (2)
2. Questionnaire design and training of enumerators	2 weeks	Anthropologist, counterpart sociologist, research assistants (2) survey enumerators (6)
3. Questionnaire pre-test	2 weeks	Anthropologist, counterpart sociologist, research assistants (2) survey enumerators (6)
4. Questionnaire administration	4 weeks	Anthropologist, counterpart sociologist, survey enumerators (6)
5. Computerization of data from survey and inventory	2 weeks	Anthropologist, counterpart sociologist, research assistants (2)
6. Survey and inventory analysis and final report to GOR	4 weeks	Anthropologist, counterpart sociologist

E. Description of Activities

Inventory of Existing Data (4 weeks)

The inventory of existing data sources will be conducted by the anthropologist and the counterpart sociologist from Minzodeco, aided by two research assistants. The anthropologist will spend approximately one week in the U.S. or Europe, gathering relevant historical data on the population of Ruhengeri prefecture. He will then proceed to Kigali to join the on-going research activities of the counterpart and the research assistants. Approximately two weeks of further data collection in Rwanda will follow. A final one-week period will be used for data collection and preliminary analysis. Information collected will be stored in the computer.

The objective of the inventory is to gather existing historical data on population of Ruhengeri or on socio-economically similar areas of Rwanda. By this means historical trends may be evaluated. It is expected, however, that few reliable data exist and that the questionnaire survey will supply the major part of the CRDP socio-economic analysis information.

Questionnaire Survey (16 weeks)

The questionnaire survey will be managed by the social anthropologist and his Minzodeco counterpart sociologist and be conducted by 6 enumerators recruited from Minzodeco or from the Ruhengeri campus of the National University.

The enumerators will work in three two-person teams (one male and one female per team), interviewing 300 family heads and their principal wife in a 4-week period (24 work days). The total sample will thus be 600 persons from 300 households. It will be stratified to include an appropriate proportion of female-headed households (about 1/5), in which case the oldest unmarried son will also be interviewed.

Fifty households will be randomly selected from each of 6 communes of the 16 composing Ruhengeri prefecture. These communes, typifying the environmental variety and ecological problems of Ruhengeri, are: Mukingo, Kinigi, Kigombe (Ruhengeri town), Kidaho, Cyeru, and Nyamutera. They represent all four agro-ecological zones (lava zone, Buberuka highlands, central plateau, Zaire-Nile divide), proximity to the Volcanoes National Park, areas bordering on lake shore and swamp land, a zone of rapid urbanization, and the future site of two USAID development projects--cropping systems and agro-forestry. Environmental problems in these communes include water pollution, water shortage, soil erosion, loss of soil fertility, deforestation, uncontrolled urbanization, and poaching of protected flora and fauna. The following chart summarizes these commune characteristics and ecological problems.

<u>Commune</u>	<u>Characteristics</u>	<u>Problems</u>
Mukingo	Lava land zone, high altitude borders Volcanoes National Park, high population density	Water shortage, poaching, over-grazing on pasture lands

Kinigi	Lava land zone, high altitude, high population density, borders on Volcanoes National Park, tourism center	Water shortage, poaching, overgrazing of stock, deforestation
Kigombe (Ruhengeri town)	Urban market center, prefecture administrative center, important road junction, tourism	Uncontrolled urbanization, water shortage, and water pollution, risk of epidemics
Kidaho	Lava land zone, high altitude, high population density, borders PNV	Acute water shortage, high incidence of water-borne illness from water pollution
Cyeru	Buberuka highlands zone, largest of Ruhengeri communes, borders on Rugezi swamp and Lake Bulera (major watershed into Mukungwa river)	High soil erosion, loss of soil fertility, overgrazing, deforestation, strip mining (wolfram), water pollution and high incidence of water-born illness
Nyamutera	Central plateau and Zaire-Nile zones, low altitude in east rising toward Zaire-Nile divide	Erosion and loss of soil fertility, deforestation

#### Breakdown of Survey Activities

##### 1. Preliminary field investigation (2 weeks)

The socio-anthropologist, the counterpart sociologist, and two field assistants will spend two weeks in the six communes listed above, in order to fill data gaps revealed by the inventory. The objective of this activity is to generate sufficient understanding of demographic and socio-economic variables to permit design of the questionnaire. Intensive interviews of informants of various ages and both sexes will permit accurate design of questions. The team will be based in Ruhengeri town and will travel to the field sites each day.

##### 2. Questionnaire design (2 weeks)

Upon returning from Ruhengeri to Kigali, the 4-person field team will draw up the questionnaire and print it in sufficient number for pre-testing. The six enumerators will be hired from the National University or recruited as available from the Ministry of Social Affairs and Community Development. Enumerators will receive training in techniques of questionnaire survey administration.

3. Questionnaire pre-test (2 weeks)

Following initial training of the enumerators, the questionnaire will be administered over a 3-day period in Nyakinama commune near the National University in Ruhengeri. The results of the pre-test will be examined by all participants in the design and administration of the survey, including research assistants and enumerators. The questionnaire will be modified as necessary and printed in final form. The same questionnaire will be used in the six communes.

The pre-test period will also constitute the final phase of training of the enumerators. The three 2-person teams will give the questionnaire under normal working conditions, that is they will each interview four household heads and their principal wife (or female head and eldest son) per day for three days. A total of 36 interviews will thus be generated.

4. Questionnaire administration (4 weeks)

During this period the enumerators will be based in Ruhengeri town. They will be driven daily to the field, where they will work until the end of administrative hours, returning in the evening to their base.

Each commune will be covered by the enumerator teams in turn, 4 to 5 days being normally required by commune. The sampling site or sites within the communes (lake front, hill top, valley bottom, etc.) will have been selected in advance during the preliminary field investigation stage and will represent the key area or areas of environmental deterioration per commune. Within each designated area, the enumerator teams will interview every "nth" household, in order to arrive at a total of 50 households per commune. It is thus only in this sense that the final sample can be said to be randomly selected. One or a maximum of two survey sites in each commune will be sufficient to generate a proper understanding of the population of Ruhengeri and its dynamic interrelationship with the natural environment.

5. Computerization of data (2 weeks)

Results of the survey will be coded and computerized by the anthropologist, counterpart sociologist, and two research assistants. The data will be manipulated to yield the information necessary for analysis.

6. Questionnaire survey analysis (4 weeks)

Once the results of the survey have been computerized and printed out for examination, the anthropologist and the counterpart sociologist will make their final analysis of both the inventory and survey data. This will be presented in a final report issued to the GOR Inter-ministerial Council for the Environment, which, in turn, will make specific policy recommendations to the President.

Post-Project Questionnaire Survey (10 weeks)

During the final months of the CRDP the questionnaire survey will be administered again in the same field sites discussed above. The sample will, however, not be the same as for the first questionnaire survey. It could, for example, represent every "nth plus 1" household in these sites. What is important is that the same population be surveyed in order

to assess changes resulting from specific CRDP and GOR interventions in these local areas.

The schedule of activities during this survey resembles that for the first survey, except that there will be no preliminary field investigation, questionnaire design, or pre-testing stages. Training of enumerators will occur on-the-job in the field, since it is expected that several will have participated in the previous effort.

## F. Format for Findings

### 1. Initial Socio-economic Analysis

At the end of the consecutive inventory and questionnaire survey efforts, a report will be submitted by the anthropologist and the Minasodeco sociologist to the GOR Inter-ministerial Council for the Environment. It will include the following:

### 2. Conclusions

- a. Establishment of a clear baseline set of values for the variables in all four areas of data collection: population growth and composition; patterns of environmental use; perception of ecological problems and trends; popular participation in conservation efforts and programs.
- b. Establishment of trends in variables through comparison of questionnaire responses of different age groups and with historical data from the inventory.
- c. Determination of key human variables correlated with the process of ecological deterioration of various types.
- d. Elaboration of a conceptual model of the dynamic interrelationships between the various key demographic and socio-economic variables involved in the process of environmental degradation.
- e. Projections of future trends in these variables under various assumptions.
- f. Simulation of future ecological effects from various scenarios of change in major variables.
- g. Correlation of popular awareness of environmental deterioration with popular participation in traditional or governmental conservation efforts.
- h. Correlation of awareness and participation of population with the type, degree, and rate of environmental degradation.
- i. Appraisal of effectiveness of governmental, educational, training, or conservation programs in stemming environmental deterioration.

### 3. Recommendations

- a. Policy options for the GOR based on simulations of future conditions under several assumptions of change.
- b. Types of educational, training, and conservation-oriented demonstration programs best suited to the level of popular awareness of ecological deterioration and to their experience of taking effective action to mitigate this process.

#### Post-Project Socio-economic Analysis (10 weeks)

The second questionnaire survey will produce a report similar to that described above. It will examine changes in variables, particularly those susceptible to change from the interventions and demonstration projects carried out by the CRDP, other donor development projects, or GOR policy action. Since it is unlikely that demonstration projects will be carried out in all field survey sites, those not directly affected will act as a control group for the evaluation of intervention effectiveness.

This second survey will also constitute the first follow-up activity by the GOR in what is hoped will be a long-term socio-economic monitoring process in Ruhengeri, a methodology easily replicable in other prefectures of the country. This coupled with natural environmental monitoring in the same locations will lead to greatly increased reliability of projections based on trend data, permitting the GOR to intervene in a more timely and effective manner to mitigate ecological trouble spots.

#### Project Evaluation and Recommendations

As an aid in the final evaluation of the CRDP, the post-project survey report will examine the effectiveness of all educational, training, outreach, and demonstration projects conducted in the areas of the initial socio-economic field investigation. It will note changes in the local population's perception of environmental problems and trends and in their actual or intended participation in on-going or future traditional or government-sponsored conservation efforts, including education and training in appropriate technology, soil terracing, tree planting, crop rotation, stockraising, and sanitation and hygiene. Recommendations to the GOR for future actions based on the experience of the CRDP will be made.

Trends occurring over the three years of the CRDP in those variables largely independent of outside intervention, such as population growth rate and migration patterns, can be more clearly defined, thus beginning the process of socio-economic monitoring of the population of Ruhengeri. Such monitoring may result in modification of the conceptual model.

14.1.2 Human Resources: Terms of Reference for the Public Health Sector

14.1.2.1 General Description of the Public Health Inventory

The purpose of the inventory in the public health sector is to 1) develop, from historic data, a health profile of the inhabitants of the communes of Kinigi, Kidaho, Cyeru, Nyamutera, Nkuli, and Ruhengeri, and 2) analyze historic trends in human health and their relationship to the development of natural resources and population pressures.

During the inventory, relevant health sector information will be collected in the following manner:

1. Search of the Literature

The Health Ministry, government and private national institutions, donor projects, information and documentation centers, research centers, government and non-government hospitals, health centers and other health facilities will be consulted for published and unpublished documents.

2. Study of Statistical Data

The study team will gather all available health statistics on the representative communes from national, regional and local sources.

3. Filed Inspections

Field visits and inspections of health facilities servicing the representative communes will be made to characterize the adequacy of equipment, materials, medical supplies, preventive medicine practices and administrative procedures.

4. Interviews

The inventory will prepare an information data base on the health care system, health laws, health administration, and disease profile of the representative communes. Of particular interest are the current trends in disease patterns for:

- a. malnutrition;
- b. fecally transmitted diseases;
- c. air-borne diseases;
- d. snail- and anthropod-born diseases;
- e. leprosy, traucoma, etc.;
- f. venereal diseases; and
- g. mental health.

The data base will be analyzed at the end of each inventory activity for the following purposes:

- a. to test the adequacy of the data-base program design, determine required changes, and introduce any necessary changes to the model;

- b. to determine the areas of data-base insufficiency;
- c. to recommend modifications, if any, required in the field investigations including any additional investigations which have been identified as a result of data manipulation; and
- d. to prepare, as required, an amended work plan and budget for modifications and additions to the field investigations.

The data base will be focused on the following information:

- a. identify and quantify the principal health problems in the representative communes;
- b. characterize the health care resources and services supporting these communes;
- c. determine the epidemiological factors (demographic, socio-economic, environmental, and administrative) for each nosology by geographic or ecological region;
- d. determine trends in existing nosology resulting from the development policies for natural resources;
- e. determine the magnitude and importance of beneficial and/or adverse health impacts created by project policies in the Ruhengeri Prefecture;
- f. prepare a monitoring program for the public health sector. The health sector monitoring program will enhance the current health reporting system by indicating monitoring requirements for specific development and policy decisions. The monitoring program will include recommendations of specific field studies required to supplement or establish understanding of a health problem; and
- g. develop a model to project the adverse and/or beneficial consequences to the public health sector or development projects and policies.

#### 14.1.2.2 General Descriptions of Public Health Field Investigations

Field investigations will be conducted in conjunction with the socio-economic survey to supplement and expand the health profile data base for the representative communes of Kidaho, Kinigi, Mukingo, Nyamutera, Gatonde, and Cyeru. The field study will consist of physical examinations including blood, stool, and urine analysis. The physical examinations will be conducted at the Ruhengeri Hospital as a government counterpart contribution and will be based on physical examination criteria and questionnaires prepared by the public health study team in consultation with the concerned national medical authorities. This survey sample will include the adult members of the 60 families per commune interviewed by the Human Resources Qualitative Survey

plus at least two dependent children from each family, adequately representing distribution between sex and age. The medical examination will take place within two weeks of the completion of the human resources survey team's work. The cost of meals and transportation of the sample population for the purpose of the medical examination will be borne by the CRDP project.

The medical examination will be sufficiently detailed to provide an assessment of the current disease spectrum in the population of each representative commune. Diseases will be grouped according to their epidemiological character, e.g., nutrition, fecally transmitted diseases, air-borne diseases, leprosy, venereal and mental diseases, traucoma, zooroses, etc. The results shall be integrated into the data base. (Senior cases detected among the sample population should be treated at GOR expense at the Ruhengeri Hospital or at an appropriate local dispensary).

Predictions of changes in current disease patterns resulting from development policies and programs may be based on an evaluation of 1) human disease profile, 2) population movements and changes in population densities, 3) changes in arthropod and snail vector populations, 4) changes in income levels, 5) changes in water regime and availability for domestic use; 6) changes in human habit patterns, and 7) changes in agricultural practices that modify the relationship between man and disease sources.

Where knowledge of clinical impact and epidemiological understanding is relatively advanced, accurate judgements may be expected on the potential changes in disease patterns due to development policies and projects, e.g., malaria, schistosomiasis, etc. Where this knowledge is lacking, less confidence may be placed on predictive analysis. A factor to quantify the level of confidence of predicted changes shall be developed where possible.

The CRDP will establish, in consultation with national health authorities, a health monitoring program for representative communes to keep a periodic flow of information on the health status of the population to the data base. The program will define the sampling technique, frequency of medical examinations and parameters for the health monitoring program. This endeavor will require financing from outside the CRDP core budget.

#### 14.1.2.3 Terms of Reference for Public Health Epidemiologist

##### A. Objectives:

1. to establish, with the computer specialist, the data base for the public health sector;
2. to establish statistical programs for predictive analysis from the data base;
3. to inventory the existing literature, records, documents, and data available from national services for submission to the data base;

4. to inventory the records at national and local health services to determine the historic health profile of the representative communes;
5. to prepare the medical examination to be completed by the Ruhengeri hospital;
6. to assist the human resources study team in the preparation of the questionnaire for their field survey for the health related issues;
7. to establish a continuing monitoring program on the health status of representative communes; and
8. to establish the methodology in consultation with the other CRDP study teams for the integrated interpretation of trends and predictive analysis in response to current and proposed government policies and development projects.

B. Personnel Required

The epidemiologist shall have the following experience and qualifications:

1. at least 10 years experience in the field of tropical epidemiology;
2. graduate degree in epidemiology (related medical degree would be acceptable with experience in tropical epidemiology); and
3. fluent in the French and English languages.

C. Time Period

two months in the first year  
one month in the second year  
one month in the third year

D. Description of Duties

Under the overall direction of the Project Field Director, the epidemiologist will perform the following duties:

1. develop the work program for the GOR epidemiologist to be assigned to the Public Health study team as government counterpart personnel.
2. identify available software for data base storage and data treatment appropriate for public health profile data base.
3. identify available computer software for the statistical and simulation analyses of information

and data from the data base. State-of-the-art software for microcomputers will be used by the CRDP project. Consult with the socio-anthropologist on the composition of the socio-economic study sample.

4. using same sample, participate in and design an inventory for the health profile. He will be responsible for assuring that the public health data base is collected and responsive to the CRDP objectives and to the requirements of other CRDP study groups and government decision makers. The data must be compatible with the CRDP analytical methodology for trends and predictive analysis.
5. assist the computer specialists with the establishment of the data base, statistical analysis and simulation models, as appropriate. The epidemiologist will be responsible for assuring that the data is correctly stored and treated by the system.
6. establish a program for the medical examinations of sample populations from the representative communes including methodology for assuring random samples from non-adult groups, transportation, timing of examinations, flow of the results to the data base, etc.
7. with CRDP Field Director, make arrangements to treat serious cases of illness turned up in the tests for the public health profile.
8. review of the results of the medical examinations to determine mid-course or other corrections to assure that the project goals are met.
9. identify requirements for additional projects and studies to complete the data base and the integrated resource allocation methodology.
10. prepare project descriptions and cost estimates for the projects and/or studies identified for funding by the government or donors.

E. Counterpart

One GOR epidemiologist will be trained in all the above duties.

F. Format of Findings

The completion by the epidemiologist of the above terms of reference assumes:

1. provision by the government of counterpart personnel,

data-base preparation, inventory and methodology development stages; and

2. provision of government counterpart services for the medical examinations.

The outputs from the epidemiologist are outlined in the objective section above. The findings will be presented to the government in the form of on-line computer services supplemented with listings, user instructions and written explanations on the theory and applications of appropriate methodologies. The Project Director will be responsible for the overall project report.

14.1.3 Human Resources: Terms of Reference for the Agricultural Economist

Historical data on agricultural practices in Rwanda can be coupled with data on current agricultural practices to provide the basis for an analysis of the trends in agriculture and the economic importance of these trends to the future of Rwanda. Current agricultural projects in Rwanda should be able to provide a significant contribution to the integrated resource management data base. The economic importance of commercial and food crops and the related aspects such as land-use practices and labor requirements should be considered in the integrated resource management decisions.

A. Duties of the agricultural economist will include:

1. inventory of current and historical sources for agricultural data on Ruhengeri. Integrate this documented data with data collected by AID's Agricultural Survey project into the CRDP data base.
2. work with the sociologist/anthropologist in the design and study of farm practices and budgets in the Ruhengeri communes.
3. assist the development of the trend analysis methodology to assess the costs of continued environmental degradation on agriculture.
4. make recommendations of programs to improve agricultural production and optimize the agriculture/natural resource balance.
5. assist the development of educational materials for the formal and non-formal education campaigns.

B. Qualifications

The individual selected should have expertise in agricultural economics at the level of a Ph.D. or equivalent with demonstrated work experience in the field. Experience in Rwanda would be desirable but he/she should have prior experience working in developing countries, prior experience functioning in the role of a trainer, and French language capability (FSI 3). The specialist should be familiar with research methods, data collection, computer assisted data analysis, and data presentation.

C. Time Periods

The agricultural economist will be required for a period of two and one-half months (2.5) over the life of the project.

D. Counterpart Training

The agricultural economist will work with one Rwandan counterpart from either the Ministry of Agriculture or the Ministry of Plan. This counterpart will be trained in data collection and interpretation and will continue making additions to the CRDP data base during the life of the project.

## 14.2 Physical Resources Survey

### 14.2.1 Physical Resources: Water Quality Study

An accurate knowledge of the present water quality is essential to any evaluation of resource allocation policy.

In the apparent absence of routine monitoring of water quality by any national service, the CRDP proposes to develop a system to monitor key water parameters. This information, along with selected information from national services, monitoring climate and surface water levels and streamflows will provide an almost complete hydrological data base on water supplies, rivers, streams, swamps, and lakes. The results of the studies will support the work of health, physical resources, and biosphere teams.

The monitoring program will be established during the inventory period and field activities for the collection and analysis of water samples would commence early. Field samples will be collected according to seasonal changes in water quality. Initially samples will be sent to the water analysis laboratory of the REGIDESO at Kigali or any laboratory designated by the government. The costs of seasonal analysis during the project life will be shared by the project and the government. Analysis will be made in the field for parameters not amenable to preservation by using portable test kits.

The monitoring program to be designated by the CRDP team will consider, at a minimum, the following parameters, as appropriate:

1. sediment measures for suspended load concentrations
2. dissolved oxygen
3. temperature
4. pH, alkalinity
5. suspended solids
6. biochemical oxygen demand (BOD<sub>5</sub>)
7. fecal coliform counts.

Sample points will include public and private, rural and urban supplies within representative communes and natural streams, rivers, swamps, and lakes affected by activities such as mining, agriculture, urbanization, etc. Samples will be analyzed in the United States for specific toxic organic and inorganic substances. In addition, other water analyses may be conducted in response to the specific needs of other CRDP study teams.

The CRDP study team will develop, in consultation with national authorities, a monitoring program for the continued input of water quality data from the established sampling points after termination of the CRDP. The frequency of sampling may, by necessity, be less than that established by the CRDP study team. Nevertheless, the continued regular flow of water quality information to the data base is essential to the accuracy of predictive methodology employed by environmental agencies.

14.2.2 Terms of Reference for Water Resources Engineer

A. Objectives

1. to establish, with the computer specialist, the data base for the physical resources;
2. to establish statistical and simulation programs for predictive analysis of the data base;
3. to inventory the existing literature, records, documents, and data available from national services for submission to the data base (assisted by the environmental engineer government counterpart);
4. to establish monitoring program for water quality analysis; and
5. to establish the methodology, in consultation with other CRDP study teams, for integrated interpretation of trends and predictive analysis in response to current and proposed government policies and development projects.

B. Personnel Required

The senior water resources engineer shall have the following experience and qualifications.

1. at least 15 years experience in the field of water resource and/or environmental engineering;
2. graduate degree in engineering; and
3. fluent in the French and English languages.

C. Time Period

two months in first year  
two months in second year  
one month in third year

D. Description of Duties

Under the overall direction of the Project Director, the water resources engineer will perform the following duties:

1. develop the work program for the GOR environmental engineer, meteorologist, and hydrologist assigned to the Physical Resources Study Team as government counterpart personnel.
2. identify available computer software for the statistical and simulation analysis of information and data from the data base (state-of-the-art software for microcomputers

will be used by the CRDP project). However, no attempt will be made to develop simulation models by this project.

3. supervise and participate in the inventory for physical resources. He will be responsible for assuring that the physical resources data base meet the requirements of other CRDP study groups and government decision makers and is consistent with analytical methodology for trends and predictive analysis.
4. supervise and assist the computer specialists with the establishment of the data base, statistical analysis and simulation models on the computer systems provided for the project. The water resources engineer will be responsible for assuring that the data is correctly stored and treated and for the calibration of any simulation models.
5. establish the program for water quality analysis. He will work with government counterpart personnel and agencies to reach agreement on the sampling stations, frequency of sampling, and analyses to be conducted by government services. He will be responsible to assure that government counterpart personnel assigned the duty of collecting samples are properly trained in the use of test kits to perform analysis which must be accomplished in the field and the proper methods for collecting, tagging, preserving, storage, and transporting samples for analysis to central laboratories.
6. review the results of water quality analyses to determine the need for modification of the sampling and analysis program, if any.
7. determine, in consultation with the CRDP study team and government counterpart, the methodology for using trends and predictive analysis for integrated resource management.
8. identify requirements for additional projects and studies to complete the data base and integrated resource allocation methodology.
9. prepare project descriptions and cost estimates for the projects and studies identified for funding by the government or donors.

E. Format of Findings

The outputs are expected to be as outlined in the objectives above. The finding will be presented to the government in the form of a written interpretation of the water quality study findings with recommendations for corrective actions and on-line computer services supplemented with listing, user instructions and written explanations on application of appropriate methodologies. The CRDP Field Director will be responsible for the overall project report.

14.2.3 Physical Resources: Terms of Reference for Soils Study

A. Objectives

1. Identification and characterization of soil types and distribution of soil types in the Ruhengeri Prefecture. [There should be an overall survey of the Prefecture but subsequent work should focus on populated areas or areas that will be directly impacted by human activities such as forestry, agriculture, and livestock.]
2. Characterization of the extent of soil erosion in the Ruhengeri Prefecture. [This work should focus on sites representing different levels of activity or development. The agricultural and forestry projects should be able to provide the best contributions of data but the survey should also include other sites selected for their representative nature.]
3. Determination of the relationships between soil loss and soil types, slope, vegetation/crop cover, climate, cultivation practice, etc.
4. Preparation of recommendations for a soil conservation management plan for Ruhengeri Prefecture and for existing soil management programs.
5. Development of educational materials for soil conservation/rehabilitation for public education.
6. Training of Rwandan agricultural extension agents in the importance of environmental management, data collection, and resource planning as it relates to soil conservation/rehabilitation.

B. Personnel Required

1. United States Professional.
  - a. Soil scientist/agronomist.

The individual selected should have knowledge of soil types, soil management and rehabilitation practices. Experience in Rwanda would be desirable but he/she should have prior experience working in developing countries, prior experience functioning in the role of a trainer, and French language capability. The specialist should be familiar with research methods, data collection, computer assisted data analysis, and data presentation.

2. Rwandan Counterparts (GOR).

- a. Soil Scientist from the Faculty of Agriculture at the University of Rwanda in Butare. The individual selected should have knowledge of soils and agricultural practices in the Ruhengeri and should understand the principles of integrated resource management. He/she should be comfortable in a training role, capable of expressing the concepts of soil resource management in a clear, concise manner. The individual should have experience with data collection and analysis as a fundamental requirement.
- b. Resource Management Planner. The individual selected should have a broad background with some understanding of soil conservation and natural resource management. This person will be assigned to the "Coordinating Unit" and should be competent in data analysis, interpretation, and presentation.

C. Time Period

1. U.S. Professional: 2.5 workmonths
2. Rwandan Counterparts:
  1. Soil Scientist: 4 workmonths
  2. Resource Management Planner: 2 workmonths

D. Description of Duties

1. U.S. Professional
  - a. On or about the start of Project Month 6 (August 1984) the identified soil scientist/agronomist will travel to Rwanda for approximately one month. While in Rwanda he/she will:
    - 1) Gather, review, and compile existing data on soil type/ quality and soil erosion in Ruhengeri Prefecture. This will require surveying literature and reports in the U.S., Europe, and Rwanda as well as site visits to Ruhengeri Prefecture. Coordination with other CRDP activities will facilitate data collection.
    - 2) Analyze existing GOR institutional arrangements for directing soil conservation/rehabilitation efforts and managing soil resources.
    - 3) Begin the transformation of data into compatible form for computer input.

- 4) Make recommendations for soil conservation/rehabilitation programs both existing and planned. These recommendations should include methods of increasing citizen awareness and participation, and include resource management principles and practices.
  - 5) Prepare educational materials and suggestions for the CRDP educational activity. Review the curriculum for the training of agricultural/soil conservation extension agents and suggest improvements in that curriculum.
  - 6) Train the Rwandan soil scientist to continue with the data collection, the transformation of data to a form compatible with computer use, and the preparation of educational materials aimed at the citizens of Rwanda. The soil scientists will continue to train extension agents in data collection methodology.
  - 7) Train the Resource Management Planner in data transformation and storage.
- b. Upon his/her return to the United States, the soil scientist/agronomist will prepare a report outlining the status of the soil resource management portion of the project. He/she will also:
- 1) Provide technical advice to the ETMA/CRDP staff and to the Rwandan counterparts concerning data collection and transformation.
  - 2) Begin to analyze the data to insure consistency within the data base with respect to the terminology, method of collection, and expression.
  - 3) Perform a preliminary analysis of the data to describe the relationship of key variables related to soil management. These variables would include slope, soil type, vegetation cover, agricultural practices, climate, and others.
  - 4) Provide CRDP staff with additional suggestions for educational campaigns.
- c. On or about the beginning of Project Month 18 (August 1985) the specialist will return to Rwanda for approximately 10 days to:
- 1) Check the data base for appropriateness and completeness.
  - 2) Use computer projections to analyze resource trends based on modified scenarios.
  - 3) Work with Rwandan soil scientist to insure continued data collection to update the data base and continued educational/training efforts.

- 4) Work with Rwandan Resource Management Planner to understand the projections and their use as a management/decision making tool.
  - 5) Provide input into existing soil resource management programs and training curriculums.
  - 6) Prepare educational materials to be incorporated into the CRDP activity.
- d. Any additional time in either the U.S. or Rwanda should be spent:
- 1) Improving Rwandan resource projection capability.
  - 2) Preparation of report on the status and trends of soil resources in Ruhengeri Prefecture.
  - 3) Training Rwandan counterparts.

## 2. Rwandan Counterparts

### a. Soil Scientist.

- 1) Assist U.S. Professional in assembling data in Rwanda and continue data search after U.S. Professional has returned to U.S.
- 2) Train extension agents to participate in the resource surveys and field data collection.
- 3) Manage soil resource inventories in Rwanda.
- 4) Become competent in the transformation of data for computer use and investigate improvements in the data base (appropriateness).

### b. Resource Management Planner.

- 1) Assist the U.S. Professional with the institutional analysis of soil management in Rwanda.
- 2) Become competent in the data transformation and entry for storage as a computer data base.
- 3) Prepare recommendations for existing and future soil conservation/rehabilitation projects in Rwanda.
- 4) Learn to use the simulation models as a tool for resource projection and management.
- 5) Prepare resource maps of soil types, distribution, and erosion in the Ruhengeri.

E. Format of Input

1. Variable versus time as available for past to present and projection to 2010 (soil depth, fertility, loss).
2. Statements of methodology and methodological assumptions for:
  - a. Data collection. What data will be collected; how will it be collected; and why will it be collected?
  - b. Variable weighting. How will variables be treated for modeling purposes, what are key assumptions?
  - c. Projections. What are the assumptions and objectives of the projections, how will they be devised?
3. Data cards.

F. Format for Presentation of Findings

1. Data Base Format.
  - a. Maps:
    - 1) Resource inventory/topographical map showing regional distribution of soil type, land use, vegetation cover, and slope.
    - 2) Isoerosivity map for Ruhengeri.
  - b. Tables:
    - 1) Soil type, area, brief description of some of the main characteristics involving erosiveness or productive use of Rwandan soils.
    - 2) Soil loss by commune: commune, area (ha), erosion (tons/ha/yr), surface layer erosion (cm/yr).
    - 3) Land capability classification: class, area (km<sup>2</sup>), % of total area, production capacity.
  - c. Narrative:
    - 1) Resource base.
    - 2) Current and projected land use.

- c. Principal problems.
    - 1) erosion.
    - 2) land capability.
  - d. Institutional analysis.
2. Analysis of Present Trends
- a. Map overlays showing progression of land use, vegetation cover depletion, changes in soil quality to present.
  - b. Matrices showing soil loss versus land use, vegetation cover, slope.
  - c. Development of cost-benefit ratios for land use versus resource degradation.
2. Trends Based on Modified Scenarios.
3. Recommendations:
- a. Soil conservation programs.
  - b. Soil rehabilitation programs.
  - c. Institutional arrangements for management.
  - d. Curriculum for extension agents.
  - e. Educational materials.

### 14.3 Biosphere Survey

#### 14.3.1 Biosphere: Terms of Reference for Wildlife/Wildlands Management Study

##### A. Objectives

1. Characterization of ecological/life zones occurring in the Ruhengeri Prefecture.
2. Inventory and evaluation of the status of native flora and fauna in the Ruhengeri Prefecture.
3. Identification of unique ecological areas and transitional areas for vegetation remnants or flora/fauna species not already protected in the existing national park.
4. Determination of current and potential impact of the Rwandan population on these unique ecological areas, and on the resource base throughout the Ruhengeri Prefecture.
5. Preparation of recommendations for wildlife/wildlands management plan for Ruhengeri Prefecture and for existing management programs.
6. Development of educational material for wildlife/wildlands management.
7. Training of Rwandan extension agents (Eaux et Forets, Conservation des Faunes) in the importance of environmental management, data collection, data analysis, data interpretation, and resource planning.
8. Educate the public in the values of wildlife/wildlands management and conservation.

##### B. Personnel Required

1. United States Professional.
  - a. Wildlife/wildlands management specialist.  
The individual selected should have knowledge of wildlife/wildlands management strategies and be familiar with the flora and fauna of Rwanda. He/she should have prior experience working in developing countries, prior experience functioning in the role of a trainer, and French language capability. The specialist should be familiar with research methods, data collection, computer assisted data analysis, and data presentation.

2. Rwandan Counterparts (GOR)

- a. Wildlife/wildlands management specialist from Ministry of Natural Resources with knowledge of the flora and fauna of Ruhengeri Prefecture. The individual selected should understand the principles of integrated resource management. He/she should be comfortable in a training role, capable of expressing the concepts of wildlife/wildlands management in a clear, concise manner. The individual should have experience with data collection and analysis as a fundamental requirement.
- b. Resource management planner. The individual selected will need a broad background with some understanding of wildlife and natural resource management. This person will be assigned to the "Coordinating Unit" and should be competent in data analysis, interpretation, and presentation.
- c. Wildlife agents (Eaux et Forets, Ministry of Natural Resources). These "extension agents" need to understand wildlife data collection.

C. Time Period

- |                                    |                |
|------------------------------------|----------------|
| 1. U.S. Professional:              | 2.5 workmonths |
| 2. Rwandan Counterparts:           |                |
| a. Wildlife specialist:            | 4 workmonths   |
| b. Resource Management specialist: | 2 workmonths   |
| c. Wildlife agents:                | 6 workmonths   |

D. Description of Duties

1. U.S. Professional
  - a. On or about the start of Project Month 7 (September 1984) the identified wildlife specialist will travel to Rwanda for approximately one month.

While in Rwanda he/she will:

- 1) Gather, review, and compile existing data on wildlife/wildlands (native flora and fauna) in Ruhengeri Prefecture. This will require surveying literature and reports in the U.S., Europe, and Rwanda as well as site visits to Ruhengeri Prefecture. Coordination with other CRDP activities will facilitate data collection.

- 2) Begin the transformation of data into compatible form for computer input.
  - 3) Make recommendations for wildlife/wildlands programs both existing and planned. These recommendations should include methods of increasing citizen awareness and participation, and inclusion of resource management principles and practices.
  - 4) Prepare educational materials and suggestions for the CRDP educational activity. Review the curriculum for the training of wildlife agents and suggest improvements for that curriculum.
  - 5) Train the Rwandan wildlife specialist to continue with the data collection, the transformation of data to a form compatible to the computer input, and the preparation of educational materials aimed at the citizens of Rwanda. The wildlife specialist will continue to train wildlife agents based on the data collection needs.
  - 6) Train wildlife agents in methods of data collection.
  - 7) Train Resource Management specialists in data transformation and storage.
- b. Upon his/her return to the United States, the wildlife specialist will prepare a report outlining the status of the wildlife portion of the project.

The specialist will also:

- 1) Provide technical advice to the ETMA/CRDP staff and to the Rwandan counterparts concerning data collection and transformation.
- 2) Begin to analyze the data to insure consistency within the data base with respect to the terminology, method of collection, and expression.
- 3) Analyze the data in a preliminary sense to describe the relationship of Rwandan wildlife resources to exploitation and population pressures. Efforts should be made to characterize key variables such as population size, habitat destruction, and utilization patterns.
- 4) Provide CRDP staff with additional suggestions for educational campaigns.

c. On or about the beginning of Project Month 18 (August 1985) the specialist will return to Rwanda for approximately 10 days to:

- 1) Check the data base for appropriateness and completeness.
- 2) Use computer projections to analyze resource trends based on modified scenarios.
- 3) Work with Rwandan wildlife specialist to insure continued data collection to update the data base and continued educational/training efforts.
- 4) Work with Rwandan Resource Management Planner to train him/her to understand the projections and their use as a management/decision making tool.
- 5) Provide input into existing wildlife/wildland management programs and training curricula.
- 6) Prepare educational materials to be integrated into the CRDP activity.

d. Any additional time in either Rwanda or the U.S. should be spent:

- 1) Improving Rwandan resource projection capability.
- 2) Preparation of report on the status of trends of wildlife resources in Ruhengeri Prefecture.
- 3) Training Rwandan counterparts.

## 2. Rwandan Counterparts

### a. Wildlife Specialist.

- 1) Assist U.S. Professional in assembling data in Rwanda and continue data search after U.S. Professional has returned to U.S.
- 2) Train extension agents to participate in the resource surveys and field data collection.
- 3) Manage wildlife resource inventories in Rwanda.
- 4) Become competent in the transformation of data for computer use and investigate improvements in the data base (appropriateness).

### b. Resource Management Planner.

- 1) Assist the U.S. Professional with the institutional analysis of wildlife/wildlands management in Rwanda.

- 2) Become competent in the data transformation and entry for storage as a computer data base.
- 3) Prepare recommendations for existing and future wildlife/wildlands projects in Rwanda.
- 4) Learn to use the simulation models as a tool for resource projection and management.
- 5) Prepare resource maps of ecological zones, wildlife distribution, unique and fragile ecological areas in the Ruhengeri.

c. Wildlife Agents.

- 1) Learn data collection and reporting.
- 2) Conduct inventories of flora and fauna.

E. Format of Input

1. Variable versus time as available for past to present and projections to 2010.

a. Collection of data on major variables (examples).

- 1) species diversity/distribution/population size.
- 2) population dynamics (reproduction, mortality, etc.).
- 3) human impact (poaching, destruction of habitat).
- 4) relation to agricultural projects (crop destruction).
- 5) commercial value.

2. Statements of methodology and methodological assumptions for:

- a. Data collection. What data will be collected; how will it be collected; and why will it be collected?
- b. Variable weighting. How will variables be treated for modeling purposes; what are key assumptions?
- c. Projections. What are the assumptions and objectives of the projections; how will they be devised?

3. Data Cards.

F. Format for Presentation of Findings

1. Data Base Format.

a. Maps:

- 1) Resource inventory maps showing ecozones and regional distribution/range of wildlife.

b. Tables:

- 1) Status of selected flora/fauna species: population status, information status, legal status, habitat destruction, traditional/superstitions, hunting, commercial trade, exotic competition, population recovering.

- 2) Wildland categories used or proposed.

c. Narratives:

- 1) Resource base.
- 2) Current and potential uses.
- 3) Principal problems.
- 4) Institutional analysis.
- 5) Current resource management.

2. Analysis of Present Trends.

- a. Map overlays showing progression of wildland changes to present.
- b. Matrices showing contributory factors.
- c. Development of cost-benefit ratios for use versus degradation.

3. Trends Based on Modified Scenarios

4. Recommendations:

- a. Wildlife/wildlands management programs.
- b. Institutional arrangements.
- c. Curriculum for wildlife agents.
- d. Educational materials
- e. Further studies.

### 14.3.2 Biosphere: Terms of Reference for Agro-Forestry Study

#### A. Objectives

1. Identification and characterization of major forest types throughout the Ruhengeri Prefecture.
2. Determination of current and potential forestry resource utilization and its impact on the natural resource base of Ruhengeri Prefecture.
3. Identification of current forestry/agro-forestry practices in Ruhengeri Prefecture.
4. Examination of existing forestry/agro-forestry programs in the Ruhengeri Prefecture. [This will direct the more specific activities for the agro-forestry section. The sites will depend on the existence of viable project activities. At present it is anticipated that there will be agro-forestry projects in the Buberuka sub-prefecture which will involve the communes of Cyeru, Butaro, and Nyamugali. It is also anticipated that the CRDP will design an agro-forestry project for co-financing in the area of Kinigi commune. This heavily populated area currently impacts heavily on the Virunga ecosystem.]
5. Cooperation with existing forestry/agro-forestry programs to expand their education components to include the role of integrated resource management in the future of Ruhengeri Prefecture.
6. Training of Rwandan extension agents (Eaux et Forets) in the importance of environmental management, data collection, data analysis, data interpretation, and resource planning.
7. Education of public sector of the values of forest resource conservation.

#### B. Personnel Required

##### 1. United States Professional

###### a. Agro-forestry specialist.

The individual selected should have knowledge of past and current agro-forestry practices in Africa. The individual selected should have prior experience working in developing countries, prior experience functioning in a training situation, and French language capability. He/she should be familiar with research methods and data collection in forestry, computer assisted data analysis, and energy issues in Africa.

2. Rwandan Counterparts (GOR)

a. Professional Forester, Eaux et Forêts, GOR

The individual selected should have an understanding of the principles of agro-forestry and resource management. He/she should also be comfortable in a training role, capable of expressing the concepts of agro-forestry and environmental management in a clear, concise manner. Experience with data collection and analysis is a fundamental requirement.

b. Resource Management Planner, (GOR)

The individual selected will need a broad background with some understanding of forestry. This person will be assigned to the "Coordinating Unit" and should be competent in data analysis, interpretation, and presentation.

C. Time Period

- 1. United States Professional: 2.5 workmonths
- 2. Rwandan Counterparts:
  - a. Forester: 4 workmonths
  - b. Resource Planner: 2 workmonths

D. Description of Duties

1. United States Professional.

a. On or about the start of Project Month 6 (August 1984) the identified agro-forestry specialist will travel to Rwanda for approximately one month. While in Rwanda he/she will:

- 1) Gather, review, and compile existing data on forest types and agro-forestry practices in the Ruhengeri Prefecture. This will require surveying literature and reports in the U.S., Europe, and Rwanda as well as site visits to Ruhengeri Prefecture. Coordination with other CRDP activities will facilitate data collection.
- 2) Analyze existing GOR institutional arrangements for managing forest resources.
- 3) Begin the transformation of data into compatible form for computer input.
- 4) Make recommendations for forestry/agro-forestry and plantation programs. These recommendations should include methods of improving and sustaining yields, increasing citizen awareness and participation, and inclusion of resource management principles and practices.

- 5) Prepare educational materials and suggestions for the CRDP educational activity. Review the curriculum for the training of forestry agents and suggest ways to improve that curriculum.
  - 6) Train the Rwandan Forester counterpart to continue with the data collection, the transformation of data to a form compatible to computer input, and to continue the preparation of educational materials designed to inform citizens of Rwanda.
- b. Upon his/her return to the United States, the agro-forestry specialist will prepare a report outlining the status of the agro-forestry portion of the project. The specialist will also:
- 1) Provide technical advice to the ETMA/CRDP staff and to the Rwandan counterparts/concerning data collection and transformation.
  - 2) Begin to analyze data to insure consistency within the data base with respect to the terminology, method of collection, and expression.
  - 3) Analyze data in a preliminary sense to look at the relationship of forests and plantations to variables of land use practice and resource utilization. Efforts should be made to:
    - a. characterize the relationships of key variables; and
    - b. characterize the current status and trends.
  - 4) Provide CRDP staff with additional suggestions for educational campaigns.
- c. On or about the beginning of Project Month 18 (August 1985) the specialist will return to Rwanda for approximately 10 days to:
- 1) Check data base for appropriateness and completeness.
  - 2) Use computer projections to analyze resource trends based on modified scenarios.
  - 3) Work with Rwandan Forester to insure continued updating of data base and continued educational/training efforts.
  - 4) Work with Rwandan Resource Management Planner to train him/her to understand the projections and their use as a management/decision-making tool.
  - 5) Provide input into existing agro-forestry and resource management projects.

- 6) Prepare educational materials.
- d. Any additional time in either Rwanda or the U.S. should be spent:
- 1) Training Rwandan counterparts/extension agents.
  - 2) Providing suggestions for improved output.
  - 3) Improving Rwandan resource projection capability.
  - 4) Preparation of report on status and trends of forestry resources in Ruhengeri Prefecture.

2. Rwandan Counterparts

a. Forester.

- 1) Assist U.S. Professional in assembling data in Rwanda, and continue data search after U.S. professional has returned to U.S.
- 2) Train extension agents to participate in resource surveys and field data collection.
- 3) Manage forest resource inventories in Rwanda.
- 4) Become competent in the transformation of data for computer use and investigate improvements in the data base (appropriateness).

b. Resource Management Planner.

- 1) Assist the U.S. Professional with the institutional analysis of forestry management in Rwanda.
- 2) Become competent in the data transformation and entry for storage as a data base.
- 3) Prepare recommendations for existing and future forestry/agro-forestry projects in Rwanda.
- 4) Learn to use simulation models as a tool for resource projection and management.
- 5) Prepare resource maps of forest zones/types in the Ruhengeri.

E. Format of Input

1. Variable versus time as available for past to present and projections to 2010.

- a. Collection of data on major variables (examples).
  - 1) Surface area/distribution of forests
  - 2) Major (dominant) species/diversity
  - 3) Utilization rates/trends
  - 4) Age of forests
  - 5) Relation to agriculture/population centers
  - 6) Estimated commercial value
2. Statements of methodology and methodological assumptions for:
  - a. Data collection. What data will be collected; how will it be collected; and why will it be collected?
  - b. Variable weighting. How will variables be treated for modeling purposes, what are key assumptions?
  - c. Projections. What are the assumptions and objectives of the projections, how will they be devised?
3. Data cards.

F. Format for Presentation

1. Data Base Format.
  - a. Maps:
    - 1) Resource inventory/topographical map showing regional distribution of forest types (species).
  - b. Tables:
    - 1) Estimated areas and locations of forest plantations.
  - c. Narratives:
    - 1) Status of agro-forestry technique practices in the Ruhengeri Prefecture.
    - 2) Technical evaluation.
      - a) Species.
      - b) Seed sources.
      - c) Nurseries.
      - d) Outplanting and tending.
      - f) Growth and yield.
    - 3) Principal problems.
      - a) Erosion control.
      - b) Fuelwood.
      - d) Industrial plantations.
    - 4) Institutional analysis.
    - 5) Constraints/Needs.

2. Analysis of Present Trends.
  - a. Map overlays showing progression of land use and vegetation cover depletion to present.
  - b. Matrices showing demand versus production and contributing factors.
  - c. Development of cost-benefit ratios for demand versus resource degradation.
3. Trends Based on Modified Scenarios.
4. Recommendations:
  - a. Reforestation programs.
  - b. Institutional arrangements for management.
  - c. Curriculum for agro-forestry agents.
  - d. Educational materials.

## 15.0 TERMS OF REFERENCE FOR COMPUTER SPECIALIST

### 15.1 Objectives:

- To provide support to the CRDP study teams in the development of software and its application to the computer systems provided the project.
- To provide training to government counterpart personnel in the use of the computer systems and programs provided the project with emphasis on training at least two computer specialists provided to the project from the national environmental agency.

### 15.2 Personnel Required:

The computer specialist shall have the following experience and qualifications:

- At least 5 years hands-on experience in programming in Basic, and UCSD-P code Pascal & Fortran.
- College graduate with a degree in computer science. Degree from a two-year technical college will be acceptable with appropriate experience.
- Fluent in the French and English languages.

### 15.3 Time Period:

- Five and one-half months spread over three years.

### 15.4 Description of Duties:

Under the direction of the Project Director and in consultation with the senior member of each study team, the computer specialist will:

- Develop the data base for each study team assuring that it is interactive with proposed analytical software.
- Assist the study teams with adoption of microcomputer software to the project's computer system through translation of languages or rewrite of programs. All copywrites will, however, be respected.
- Integrate AID's Agricultural Survey Project data relevant to the CRDP into the data base.
- Develop, where required, statistical programs for trend analysis in consultation with team members.
- Assist the Project Director and study teams in the development of integrated resource management modes modifying and rewriting as appropriate software developed in support of this objective.
- Prepare listings and user instructions for all software used by the CRDP project for inclusion in the final report.
- Train, at least, two computer specialists provided to the project full time by the government service responsible for the environment in the use of all hardware and software.
- Provide training to all members of the CRDP in the use of the data base and to the predictive models.
- Assure that all computer hardware is properly serviced and maintained at all times.

15.5 Format for Findings:

The results of the computer specialist's work will depend on the following assumptions:

- Provision of government counterpart personnel.

The computer specialist will be expected to produce:

- Two Rwandan Nationals fully trained in the use of all data-bases and predictive software used by the project.
- Listings and user instructions, in French and English, for all data bases and predictive software used in the project.

## 16.0 INCREASED PUBLIC AWARENESS OF ENVIRONMENTAL PROBLEMS AND SOUND RESOURCE MANAGEMENT

This part of the CRDP is geared to generating a "bottom up" approach to integrated natural resource management. The overall purpose of this public awareness component is to create an informed public that is capable of implementing local strategies of sound natural resource management. The public awareness component will concentrate on reaching the public through the following ways:

1. development of a comprehensive environmental education program for the formal education system to reach children and youth in primary, post-primary and secondary schools,
2. development of a series of non-formal education programs designed to reach adults and out-of-school youth through non-formal education and social service centers in Ruhengeri,
3. participation in demonstration projects attached to other donor projects in the Ruhengeri area.

### 16.1 Formal Education Campaign: Brief description

ETMA will provide technical assistance, training and funds to develop curricula and materials on environmental issues for primary, post-primary and secondary schools. Environmental education is being channeled through the formal school system because it offers the most systematic opportunity to reach children and youth in Rwanda. ETMA will fund an environmental curriculum specialist for a one month inventory of existing environment-related courses and materials. The specialist will then work with GOR education personnel to design a comprehensive environmental education program leading from primary school to completion of secondary school. The ETMA curriculum development effort will build on existing courses developed by the NATENRWA program in the Ministry of Education's Bureau Pedagogique d'Enseignement Secondaire (BPES). In the primary school, the emphasis will be on including more environmental and natural resource management information within the existing "Etudes de Milieu" course. After the formal education program has been designed and received appropriate approvals from the GOR, a Peace Corps volunteer curriculum advisor will work with two counterparts in the Ministry of Education to implement the program.

Curricula and materials developed for the formal education system will be introduced into the national education system. However, they will be introduced first into the Ruhengeri Prefecture, as part of the CRDP.

Because of lack of space within the Ministry of Education, ETMA will also rent an office and a small library/resource materials room for this project.

16.1.1 Terms of Reference for the Environmental Curriculum Specialist.

A. Objectives

The objectives of the Formal Education Campaign are to:

1. develop curriculum and resource materials on environmental conservation and natural resource management for primary, post-primary, and secondary schools; and
2. develop appropriate skills within the GOR to maintain the curriculum.

B. Personnel Required

Environmental Curriculum Specialist

The environmental curriculum specialist's main task will be to inventory the existing environment-related courses in the school system and make recommendations for the development of a comprehensive environmental education program.

The environmental curriculum specialist must have training and experience in curriculum evaluation and development, with specialization in environmental issues or agriculture. Prior work in this field in a less developed country is highly desirable. To function effectively in the Ministry of Education, he/she must have a strong command of written and spoken French.

C. Duties

The environmental curriculum specialist will:

1. Review background information on the Rwandan educational system, the agricultural system, and environmental problems.
2. On arrival in Rwanda, meet with appropriate officials from the Ministry of Education and other relevant ministries to obtain their suggestions and comments on problems and opportunities for environmental education programs.
3. Review existing curricula, books, teacher training materials, and audiovisual aids used in environmental education in primary, post-primary and secondary schools.
4. Visit town and rural schools (primary, post-primary and secondary) to understand the teaching/learning situation in which the environmental education program will be implemented.

5. Visit teacher training facilities to discuss in-service training (recyclage) for teachers in new curricula and materials.
6. Develop a draft plan for the environmental education program (see "Format" section for details).
7. Review the draft plan with the CRDP project director, Ministry of Education officials, and the project coordinating committee; amend as necessary.
8. Submit final plan as consultancy report.

D. Format of Output

The environmental curriculum specialist will provide to the CRDP Field Director a report which will include the following:

1. A description of existing curriculum and resource materials in the formal education system related to environmental and natural resource management issues; also, a list and samples of written materials and audiovisual aids used in these courses. If possible, the report should also include a description and indication of frequency of environment-related activities carried out through the school system (e.g., nature clubs, vegetable gardens, evening programs for the community, etc.)
2. Recommendations for an environmental education program leading from primary school to the completion of secondary school. The format will be a listing and narrative by school grade of course objectives, content, and required books or other resource materials. This curriculum will incorporate existing courses and add new ones where necessary. It will also indicate where environmental subjects might be used in other courses.
3. Recommendations concerning priorities for course development.
4. Recommendations on materials (including audiovisual aids and equipment) which will be necessary to support the new curricula and priorities for their development.
5. Recommendations concerning the usage and availability of materials from other nations.
6. Recommendations for in-service training for teachers who will use the new curricula and materials.

16.1.2 Terms of Reference for the Curriculum Advisor (Peace Corps Volunteer)

The curriculum advisor will be recruited through the Peace Corps. The curriculum advisor's main job will be to work with counterparts in the Ministry of Education's BPES and Bureau d'Enseignement Primaire et Post Primaire (BPEP/P) to write the specific curriculum (content) and develop the classroom materials recommended by the environmental curriculum specialist. The curriculum advisor will be at the level of associate expert. Training and experience in environmental curriculum and materials development is necessary. He/she must have a strong command of French to communicate with Rwandan counterparts and to read and draft education materials.

A. Specific Duties

The curriculum advisor will:

1. Review background materials on the Rwandan education system, agricultural system, environmental problems and natural resources, and the recommendations of the environmental curriculum specialist.
2. Complete a two week orientation within Rwanda to become familiar both with the classroom and teacher resources and constraints, and also critical issues in natural resource management and environmental conservation in Rwanda. This orientation should not be limited to Ruhengeri. Since the curricula developed will be used nationally, the materials developed should reflect this.
3. Establish with BPES and BPEP/P a specific schedule for writing, testing, publishing and distributing recommended curricula and materials.
4. Work half-time with a counterpart in the BPES NATENRWA program on developing curricula and materials on environmental education.
5. Work half-time with a counterpart in the BPEP/P on development of curriculum and materials to enhance the primary school course "Etudes de Milieu".
6. Coordinate with the existing Agricultural Education Project staff on environment-related courses for post-primary institutions (CERAI's).
7. Develop a system and instruments to evaluate the effectiveness of the course materials. While lack of resources may limit the extent of evaluation possible, it is anticipated that at least a sample of students will be tested before, immediately following, and six months following the new environmental education courses.

8. Coordinate with the existing AID Agricultural Education Project staff to design, test and implement in-service training programs to introduce teachers to the new curricula and materials. This in-service training will be for teachers at the primary, post-primary, and secondary level.
9. Coordinate with the existing AID Agricultural Education Project staff on the possible development of materials for teaching extension methods in natural resource management at the Nyagahanga School for Girls.
10. Coordinate with the personnel in the Ministry of Social Affairs who are developing non-formal programs in environmental education.

**B. Format of Output**

At the end of the curriculum advisor's tour of duty, there should be:

- a. a written curriculum and syllabus for environmental education courses from primary school to completion of secondary school; and
- b. written materials, posters, and other audio-visual aids to enhance and support classroom instruction.

**C. Counterparts**

One counterpart each will be selected from the Bureau Pédagogique d'Enseignement Secondaire and the Bureau Pédagogique d'Enseignement Primaire et Post Primaire to work part-time with the curriculum advisor. These counterparts should have experience in curriculum and materials development and should have some background in agriculture or a related area of natural resource management.

**16.2 Non-Formal Education Campaign: Brief Description**

The non-formal education campaign will be aimed at adults and youth in Ruhengeri who will not be reached through the formal school system. The campaign will work through existing non-formal education and social service centers (e.g., Centres Sociaux de Développement, Centres Nutritionnels, Centres Communaux de Développement et Formation Permanente, etc.) coordinated by the Ministry of Social Affairs. The overall thrust of the non-formal education campaign will be to provide the curriculum, materials and staff training which will enable these centers to conduct short courses on environmental issues/natural resource management as part of their program of activities. Topics for short courses will focus on environmental issues critical to Ruhengeri. Staff training will include technical aspects of subjects and methods of presentation. The overall plan for short courses and training will be written by the environmental curriculum specialist working with the formal education campaign. Actual design of supporting materials and the in-service training for the staff of these centers will be carried out during a six month consultancy by a doctoral candidate, non-formal education advisor.

16.2.1. Terms of Reference for the Non-Formal Environmental Curriculum Specialist (same as for formal education)

The same environmental curriculum specialist will inventory the existing environment and natural resource-related programs presently offered in non-formal education and social service centers in Ruhengeri Prefecture. The specialist will then make recommendations for the development of a series of short courses, audio-visual aids, and the like. The environmental curriculum specialist will also make recommendations concerning training in the new short courses for staff at these centers. The specialist must be trained and experienced in environmental education and non-formal education programs. Prior work in this field in a less developed country is highly desirable. To function effectively with the Ministry of Social Affairs, he/she must have a strong command of spoken and written French.

A. Duties

1. Review background information on the various non-formal education/social services centers in Ruhengeri.
2. Meet with appropriate officials from the Ministry of Social Affairs and other ministries having non-formal education or social service programs which might be involved in this campaign. These would include the Ministry of Agriculture and the Ministry of Public Health. Discussions with representatives from these ministries would be held to obtain their suggestions on expanded environment-related programs.
3. Review existing curricula, books, and materials related to the environment or natural resource management used by the non-formal education or social service center. Also, review the training procedures for their staff and outreach personnel.
4. Identify environment-related programs, demonstrations, clubs, and other activities carried out through rural centers. Assistance in gathering this information will be requested from the Ministry of Social Affairs.
5. Visit the non-formal education and social service centers located in Ruhengeri and at least one other prefecture. Although the training will begin in Ruhengeri, it will be replicated in other prefectures. Therefore, the consultant should be familiar with facilities in at least one other prefecture prior to making recommendations.
6. Develop a draft plan for expanding or including short courses in environmental conservation and natural resource management in programs of non-formal education and social service centers. Short courses will focus on critical environmental problems in Ruhengeri identified in the CRDP natural inventory. The courses will attempt to build on existing programs of non-formal education/social service centers. Course design and presentation will be based on environment-related practices and attitudes of people as identified in the socio-economic survey of this project. (See "Format" section for more details.)

7. Review draft plan with CRDP Field Director, Ministry of Social Affairs officials, and the project coordinating committee; amend as necessary.
8. Submit final plan as consultancy report.

B. Format of Output

The environmental curriculum specialist will provide to the CRDP Field Director a report which will include the following:

1. A comprehensive listing of existing programs and resource materials in non-formal education and social service centers in Ruhengeri related to environmental natural resource conservation. This will include short courses, demonstration programs, clubs, and self-help projects as appropriate. Copies of written materials and visual aids should be included in the report.
2. Recommendations for introducing, expanding or upgrading environmental programs in these centers. The plan will include specific topics for short courses or demonstrations to be developed, required supporting materials, descriptions of how these courses can be integrated into existing programs of non-formal education/social service centers, and recommendations on staff training in the new courses and course materials.
3. List of useful resources (written and visual aids) which might be available from the formal education system or other government agencies.

16.2.2 Terms of Reference for the Non-Formal Education Advisor

A non-formal education advisor will work with two counterparts from the Ministry of Social Affairs during a six month consultancy to carry out recommendations of the environmental curriculum specialist. The advisor will have a background in both environmental issues and experience in non-formal education. A good command of spoken and written French is necessary.

A. Duties

The non-formal education advisor will:

1. Participate in a two week orientation in which he/she will meet with appropriate officials in the Ministries of Social Affairs, Agriculture, and Public Health and visit non-formal education and social centers in Ruhengeri and at least one other prefecture to become familiar with teaching conditions and constraints.

2. Work with a counterpart in the central office (Kigali) of the Ministry of Social Affairs to develop a series of short courses (1 day - 2 day) and course materials on environmental issues and natural resource management. These courses will be based on the specific environmental problems of Ruhengeri Prefecture. For instance, a module might be developed on the watershed value of the montane rain forest in the eastern sectors of the Virungas. Visual aids would be used to trace the path of the Ruvumu-Rwebeye network of streams from the National Park to the plain where people use the water. This would demonstrate the water retention values of the park and other wooded areas, the possible impact of decreasing areas of dense forests, and the necessity of planting trees for ground cover and wood supplies. Other short courses might deal with specific actions that could be taken to improve agricultural land use. For example, a course on the use of windbreaks on hills to prevent erosion would include why and how windbreaks work, how to plant a windbreak, kinds of vegetation or trees which make good windbreaks, how to produce seedlings and raise them to maturity. Course materials will be simple (e.g., felt boards, posters, pamphlets for literate students, etc.). Project staff would coordinate closely with the Ministry of Agriculture to ensure nonduplication of effort and to enlist their support in course presentation. Because the CRDP may be replicated in other prefectures some of the short courses will be designed so that they can be used without alteration elsewhere in the country.
3. Develop a program and course materials for training staff at non-formal education/social service centers. The training will include technical aspects of subjects treated in the short courses, as well as suggestions and materials on how the courses should be presented. An evaluation instrument to assess staff attitudes on environmental issues will be devised for administering before and after the staff training workshops. This evaluation will be used to obtain feedback on the effectiveness of the training and course materials.
4. Review short course materials and the plan for program implementation with the Ministry of Social Affairs and other appropriate ministries.
5. Conduct staff training workshops. The first workshop will be a pilot effort to test materials and training procedures. These will be revised as necessary. When the revisions are complete, workshops will be held around the prefecture. Technical resource persons will be available at the training sessions to answer questions from the teachers.
6. Conduct follow up of a sample of teachers to evaluate the effectiveness of the training.

7. Work with at least four non-formal education/social service centers to assist them in integrating these courses into their programs.
8. Write a procedures manual for conducting training sessions in other prefectures.

B. Counterparts

There will be two counterparts in the non-formal education component of the project. One will be from the central office of the Ministry of Social Affairs and should be attached to the environmental coordinating unit of that ministry. This counterpart will be involved in all phases of the non-formal education campaign, working with both the environmental curriculum specialist and the non-formal education advisor. The second counterpart, from the Ruhengeri office of Social Affairs, will be involved in staff training, follow-up with teachers, and follow-up with non-formal education centers. The two counterparts will be responsible for replicating the non-formal education campaign in other prefectures. Counterparts for this project component, then, should preferably have training and experience in education, community development, and agriculture or natural resources. It is recommended that one counterpart be a male and one be a female to ensure that cultural constraints do not limit work in centers with programs for men or women only.

C. Output

The non-formal education advisor will provide the Project Director a report including:

1. A report of training programs presented.
2. List of staff from non-formal education and social service centers in Ruhengeri who have participated in the staff training workshops.
3. A description of short courses designed and copies of materials used in the courses.
4. Manual of procedures of training staff in new environment-related short courses.
5. A review (successes and problems) of centers where short courses have been integrated into the program.

17.0 LIST OF EQUIPMENT TO BE PROCURED

17.1 Vehicles

- Three four-wheel drive Daihatsu, Isuzu or Land Rover  
@ \$17,000 each \$ 51,000
- one motor scooter (procured locally) 1,500
- Subtotal \$ 52,500

17.2 Computer Related Equipment

Hardware

- Two each: Microcomputer with CRT Monitor 500 to 600 K RAM  
(internal 220-230 volts, 50 hz, international ROM for BASIC)
- Four each: Double side, double density 5-1/4" floppy disc control  
and drive units - 220-240 volts, 50 hz.
- Two each: 10 megabyte Winchester disc drive units - 220-240  
volts, 50 hz.
- One each: 80/120 cps dot matrix printer - 220-240 volts, 50 hz.  
Friction or traction feed, graphics capability, 6k buffer for  
serial port - 15" carriage
- Two each: 220-240 volt, 50 hz. current regulator with current  
spike suppression.

Subtotal \$ 20,500

Software

- Word processing - dBase II UCSD P-Code with Pascal and Fortran,  
Statistical, and other Software including simulation models.

Subtotal \$ 10,000

17.3 Water Quality Analysis Equipment

Portable engineer's water quality laboratory such as the Direct Reading Engineer's Laboratory (Model DR-EL, Cat. No. 12065-10) by Hach Chemical Co., Ames, Iowa	\$ 850.00
Culture incubator w/Coliver Tubes (Cat. Nos. 2078-02, 1877-00, 367-00, & 322-00) by Hach	\$ 450.00
Biochemical Oxygen Demand Apparatus (Cat. No. 2173-02), 220V, 50 Hz	\$ 495.00
Chemicals and Reagents	<u>\$ 500.00</u>
	\$2,295.00

17.4 Education Campaign Equipment

- two slide projectors	\$ 1,000.00
- one movie projector	1,000.00
- one generator (to operate audio- visual equipment in field)	2,500.00
- materials	<u>3,000.00</u>
Subtotal Equipment	\$ 7,500.00
TOTAL Equipment	\$92,295.00

## 18.0 COUNTERPART REQUIREMENTS

### A. Project Office (Section 13.0)

Two fulltime GOR employees

1. Integrated Resource Management Planner (Probably the Director of the Environmental Affairs Office) 36 months
2. Two computer specialists (Section 13.0 and 15.0) 36 months

### B. Socio-economic Study (Section 14.1) 6 months

1. Sociologist with graduate degree in law, sociology, geography, public administration, or related discipline.

### C. Public Health Survey (Section 14.2.3) 4 months

1. GOR employed epidemiologist over 3 years

### D. Water Resources Survey (Section 14.3.2)

1. GOR environmental engineer 4 months
2. GOR meteorologist 4 months
3. GOR hydrologist 4 months over 3 years

### E. Physical Resources Survey (Section 14.4)

1. Soil scientist from faculty of Agriculture, University of Rwanda in Butare. 4 months

### F. Biosphere Survey (Section 14.5)

1. Wildlife specialist from the Office of National Parks 4 months
2. Wildlife agents from the Park Service 6 months
3. Forester, Eaux et Forets, GOR 4 months

### G. Environmental Education Program: Formal (Section 16.0)

1. One curriculum specialist from the Bureau Pédagogique d'Enseignement Primaire et Post-Primaire 2 months
2. One curriculum specialist from the Bureau Pédagogique d'Enseignement Secondaire 2 months

H. Environmental Education Program: Non-Formal  
(Section 16.0)

1. GOR rural development specialist from the Ministry of Social Affairs to work with the curriculum advisor (PCV) and non-formal education advisor 2 years
2. GOR Ruhengeri Office of Social Affairs to work with the curriculum advisor (PCV) and non-formal education advisor 2 years

19.0 LIST OF PERSONS CONTACTED IN RWANDA

<u>Name</u>	<u>Position/Organization</u>
-	Prefet of Gikongoro
-	Directrice, CERAI, Kinigi, Butaro
Barnes, Dr. Richard	Director-to-be KRC
Batne, Providence	Rural Woman
Biroli, Pheneas	Director-General, Eaux & Forets, MINAGRI
Blaizeau, M.	Ministry of Plan
Boucher, Jean-Jacques	Service Planification et Relations Exterieur, Presidence de la Repulique
Brustan, Sister	Nyagahanga Agriculture School for Girls
Byecuero, Venant	Division of Soil Conservation/MINAGRI
Charlery, Bernard	
Clerge, Dr.	Director of Surgery, Ruhengeri Hospital
Condiotti, Mark	Assistant Project Manager, MGP/AWF
Crickx, Daniel A.	Hydro Bat, Kigali
Deer, Ruth	CEAER, U.S. AID
Delapierre, G.M.	Conseiller, Ministry of Plan
Desouter, Serge	Delegue aupres de la Republique Rwandaise, Association International de Developpement Rural (AIDR), Kigali
Devauchell, M.	Conseiller-Curriculum, Bureau Pedagogique, Ministry of Education
Gakwerene, Phillipe	Inspecteur des Mines et Carrieres, Ministere des Ressources Naturelles
Gaudet, Dr. John J.	REDSO, U.S. AID, Nairobi, Kenya
Gashugi, Laurent	Agronome de Prefecture/Ruhengeri, Ministere de l'Agriculture et de l'Elevage

<u>Name</u>	<u>Position/Organization</u>
Getson, Allen	Family Planning Project, U.S. AID
Girukubonje, Damascene	Chef de Bureau de Formation Cooperative
Gosselin, Louis Roland	BCEOM, Kigali
Habimana, Mine G.	Directrice, Office Nationale de Population
Habimana, Pierre	Secretary General, MRND
Habumuremyi, Damien	Assistant Social de la Commune de Nyamutera, Chef de CCDFP-Nyamutera
Hakrinana, Dr. Francois Xavier	Director-General, Basic Health Services, Ministry of Public Health
Harcourt, Dr. A.W.	Director of the Karisoke Research Center
Hoffner, W.	Ruhengeri Cooperative Project
Jost, Christian	Professor Geog., UNR-Ruhengeri
Karake, Canisuis	Head of CCDFP, Ruhengeri Prefecture
Karega, Emile	Geologist, Ministry of Natural Resources
Kayahura, Dr. Vincent	Secretary General, Ministry of Social Affairs
Kayahura, Callirte M.	Sous-prefet, Ruhengeri Prefecture
Landrada, Mukayeranga	Directrice de la Promotion Famille et de l'Environnement
Magorwa, Wellars	Directeur, Action Cooperative
Mahano, Alexis	Inspecoop (Inspector of Cooperatives), Ruhengeri
Martin, M.	Dir. du Projet, Programmes Nationaux d'Amilioration de la Pomme de Terre (PNAP)
Maurisett, M.	Conseiller-Educational Testing, Bureau Pedagogique, Ministry of Education
Miniari, Francois	Coordinateur, NATENRWA
Monfort, Dr. Allin	Conseiller, ORTPN, Presidence

<u>Name</u>	<u>Position/Organization</u>
Monfort, Nicole	Conseiller, Nature and Environment Program (NATENRWA) Bureau Pedagogique d'Enseignements, Primaire et Secondaire
Monyakaragwe, Aloysius	Chef de Division d'Assistance et Controle Action Cooperative
Morin, Robert	Project Director, Agriculture Education Program, U.S. AID
Mukamugenga, Winifren	Centre Sociales de Developpement Ruhengeri
Mukayiranga, Landrada	Directrice de la Promotion Famille et de l'Environnement
Munyambaragu, Narciose	Director of Program, Ministry of Plan
Myytasjaraqwe, Aloys	Chef de la Division Assistance et Controle
Murayi, M.	Directeur General des Etudes et Recherches Pedagogiques, MINEDUC
Ndikubwayo, Martin	Directeur de l'Urbanisme
Ntaysi, M.	Brig. General, PNV
Ntegeyintwahi, Joseph	Inspecteur de l'Education, Ruhengeri
Nyabenda, Dr. Celestin	Chef de Service, Etude et Programme, National Population Office
Nyangezi, Etienne	Directeur, ORTPN
Nyamacumu, Athanase	Office Rwandaise du Tourisme et des Parcs Nationaux (ORTPN)
Nyilinkindi, Thomas	Division de Famille et Developpement, Ministry of Social Affairs
Pliez, Alain	Chief of Hydraulic Services, Association Internationale de Developpement Rural (AIDR), Kigali
Price, Sandy	Director African Wildlife Foundation (AWF), Nairobi
Rushameza, M.	Director Studies MINAGRI
Rutayisire, Antoine	Assistant Professor, Political Science, Universite Nationale de Rwanda-Ruhengeri

<u>Name</u>	<u>Position/Organization</u>
Rwasibo, M.	Conservateur, PNV
Schuler, M.	Conseiller Suisse, Eaux & Forets/MINAGRI
Stebler, Jacques-Daniel	Projet Pilote Suisse, Conseiller, Eaux & Forets/MINAGRI
Steinkamp, Roger	Curriculum Advisor, Agriculture Education
Taofeick, Jamni	Grenarwa Technical Assistance
Taymans, Michel	AIDR
Tomassi, Dr.	Country Representative for World Health Organization
Trog, M.	Directeur, BPESL, MINEDUC
Twagirumukizza, Joseph	Chef de la Division Promotion de la Famille, d'Habitat et de l'Environnement
Ulimubenshi, Odette	Chef de la Programmation, Centre Communal de Developpement et de Formation Permanente (CCDFP)
Vandekerckhove, Michiel	EURO Action ACORD (Association de Cooperation et des Recherches pour le Developpement), Kigali
Vicary, Dr. Pierre	Director, Ruhengeri Hospital
Von der Beake, Jean-Pierre	Director of the Mountain Gorilla Project, AWF, and Advisor to ORTPN Director,
Wassmer, Patric	Professor, UNR-Ruhengeri
Wilson, Roger	Park Management Specialist, Parc National des Volcans
Zigirababili, M.	Directeur des Recherches Geographiques, Ministry of Natural Resources

20.0 LOGICAL FRAMEWORK

Long-Term  
PROJECT  
GOAL

CONDITIONS DEMONSTRATING  
ACHIEVEMENT

VERIFIABLE  
INDICATORS

ASSUMPTIONS

Sustain the natural resource base and minimize environmental problems during intensified economic development and population growth

Policies for long term sustained resource use

GOR carrying out integrated management of natural resources in Ruhengeri

Adoption of CRDP model elsewhere

Trend analysis show substantial resource base and mitigation of environmental problems

5 year plan

Gov't programs

Other donor projects adopt model

Field Observation

Surveys

Goals and purposes of other projects

Resource data base

Environmental data base

CRDP is implemented in entirety

Population growth is significantly controlled

Donor cooperation

More intensified land use

Continued financing of surveys

**PROJECT  
PURPOSE****END OF PROJECT  
CONDITIONS****VERIFIABLE  
INDICATORS****ASSUMPTIONS**

Assist the GOR in implementing integrated resource planning and management

- GOR will be using resource data base to generate other donor projects geared to the environment
- GOR making integrated resource management decisions using ecological principals
- Environmental impacts considered for development project approval
- Trained GOR personnel
- GOR perceiving impact of environmental impacts in various sectors

- Integrated data base
- Coordinating mechanism making recommendations
- Modifications in project document to mitigate environmental damage
- Environmental impact assessments of projects
- GOR budget to continue adding to data base
- GOR reallocation budget emphasis

Sustained interest by GOR  
  
Evolution of a coordinating mechanism within GOR.

**PROJECT PURPOSES****END OF PROJECT CONDITION****QUANTIFIABLE/VERIFIABLE INDICATORS****ASSUMPTIONS**

Increase public awareness of natural resource problems and trends

- Media using environmental materials
- GOR adopted environmental curriculum in formal and non-formal education systems
- GOR local government officials using management techniques
- Umuganda adopting environmental activities
- Population uses appropriate technology, ecologically sound projects

Post project survey showing people get environmental information from radio.

Curriculum exists

Observation, physical-land use measurement

Education component is included in CRDP.

Post project survey to evaluate impact of project

PROJECT OUTPUTS	CONDITIONS TO SHOW OUTPUTS ACHIEVED	VERIFIABLE INDICATORS	ASSUMPTIONS
1. Integrated data base	Central data base re- trievable, manipulatable to common scale	Computer program floppy data base or other form	Donor funding available  GOR assists in informa- tion and data retrieval
2. Assessment of environmental trends	Analysis with existing data base and identify trends in data base	Computer runs/reports with interpretation	Sufficient data base exists
3. Computer assisted resource projections	Simulations of future conditions	Computer runs and interpretation	Existing software can be modified for use in Rwanda  Available GOR personnel
4. Coordinating mechanism	Designated members to coordinate  Inter-ministerial decision- making including environ- mental concerns	Regular meeting/ minutes anecdotal Infor- mation	GOR will cooperate
5. Other donor sub- projects defined as a result of CRDP findings	Other donors considering funding or endorsement of project	Financial contribution	Project is appealing  Donor willingness  Contacts really exist

PROJECT OUTPUTS	CONTRIBUTION TO SHOW OUTPUTS ACHIEVED	VERIFIABLE INDICATORS	ASSUMPTIONS
6. Technical training	GOR trained counterparts participating in project activities (i.e. studies, analysis of seminar)	Attendance	GOR makes personnel available and continuous in related field
7. Environmental educational within the formal education system	Teachers using curriculum and materials	Observation and reports, books, audio-visual aids	Teacher cooperation
8. Environmental education through a non-formal, local education program	GOR making local level presentations  Nature clubs established; youth involved in field visits to conservation areas, resource management projects	Observation reports	Teacher cooperation
9. Demonstration Projects	Exposure of population to integrated resource management and adoption in other demo projects include environmental	Local participation observed and recorded	Other donor cooperation  People willing  Land available

21.0 TECHNICAL ASSISTANCE: PEACE CORPS CURRICULUM ADVISOR

Peace Corps Volunteer: recruitment costs, living allowance, transportation costs to and from Rwanda to be paid by Peace Corps. In-country housing for volunteers and costs associated with the ETMA CRDP will be paid by the ETMA CRDP.

One motorcycle for volunteer's professional and personal use.

The Peace Corps volunteer will fill the curriculum advisor position. The use of a Peace Corps volunteer is suggested for this project for several reasons.

1. The PCV can provide the level of required expertise at an acceptable cost.
2. Peace Corps has a well-developed infrastructure of recruitment, selection, placement and support.
3. Collaboration between Peace Corps and ETMA staff on this project will enhance their individual efforts and demonstrate the cooperation among donor agencies that is one of the project goals.
4. The PCV use can be replicated elsewhere in Rwanda at a minimum level of recurrent cost.

The Peace Corps volunteer will work under the direction of GOR staff. Rwandan counterparts will be requested for the volunteer.